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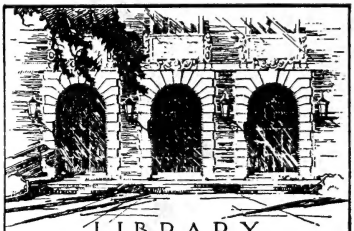

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TRANSACTIONS AND PROCEEDINGS

OF THE

ROYAL SOCIETY of SOUTH AUSTRALIA

(INCORPORATED).

VOL. XL.

[With Fifty-four Plates and Twenty-one Figures in the Text.]

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Assisted by ARTHUR M. LEA, F.E.S.

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THE

Transactions

OF

The Royal Society of South Australia.

Vol. XL.

A Note on the Occurrence and Method of Formation of the Resin (Yacca Gum) in Xanthorrhoea Quadrangulata.

By Professor T. G. B. Osborn, M.Sc.

[Read April 13, 1916.]

Plates I. to III.

References to the utilization of the resin of *Xanthorrhoea* species (the Australian "Grass Tree"), commonly known as "Yacca Gum," as a source of picric acid, in addition to its value as a varnish, are to be found in various encyclopaedic works.(1) In September last the Faculty of Science of the University of Adelaide was asked by the Hon. the Minister of Agriculture to investigate the matter further, with, amongst other things, a view to the more profitable working of the natural supplies existing in parts of this State, especially on Kangaroo Island. The majority of the questions asked were upon chemical points, but some referred to the possibility of methods of harvesting the resin other than that at present in vogue, which involves a destruction of the grass trees.

It was necessary, therefore, to enquire into the way in which the resin is formed by the plant, but upon consulting the literature available(2) no definite information could be obtained. An examination of specimens of one of the species, *Xanthorrhoea quadrangulata*, was made, and the method of

(1) Watts: "Dictionary of Chemistry"; Maiden, J. H.: "The Useful Native Plants of Australia," p. 231. 1889.

(2) I have not been able to consult—Tschirch: "Angewandte Pflanzenanatomie"; Wiesner: "Die Rohstoffe des Pflanzenreiches."

formation of the resin was observed to be peculiar, nor could references to a similar method be found in such literature as it was possible to consult.

Since the points raised are of some interest, the preliminary results are presented here. It is hoped at a later date to publish more fully upon these and other points of morphological interest concerning the genus.

External Appearance of the Plant.

The plant of *X. quadrangulata* examined was a comparatively small specimen with a stem some 24 cm. high. As will be seen from pl. i., fig. 1, numerous adventitious roots arose from the base of the stem; above them, in the portion of the stem buried in the ground, the external covering for a height of some 4-6 cm. was an apparently homogeneous layer of resin, about 1 cm. thick, the external diameter of the stem in this region being 14·5 cm. Proceeding upwards the stem was covered by closely-set leaf bases, the apices of which were charred by fire; these increased the external diameter to some 22 cm. Still higher up the leaf bases bore the full length of lamina of the wirelike form well known in this species; the laminas, however, were all dead and strongly reflexed (they are cut off in pl. i., fig. 1). The crown of functioning foliage was composed of a very large number of leaves arranged in a dense spiral. In the centre of the crown the leaves stood erect, shielding the younger ones at the growing apex. Below they made an angle of 15° to 30° with the perpendicular, falling outwards towards their apices in a graceful curve.

Macroscopic Structure of the Stem.

The stem was cut with a saw into three transverse sections—one immediately above the roots, a second 4 cm. above this (pl. ii., fig. 1); the third was some 5 cm. thick and passed through the lower part of the region covered with leaf bases (pl. ii., fig. 2). The remainder of the trunk was split vertically as nearly as possible along a diameter (pl. i., fig. 2).

The stem is seen (pl. i., fig. 2) to consist of a column of ground tissue through which the vascular bundles to the leaves run. The growing apex is slightly depressed. The youngest leaves can be seen at the centre of the depression; passing outwards from this point they rapidly elongate till at the shoulder of the depression they stand erect. Progressing from this point downwards they gradually become horizontal and finally strongly reflexed. Ultimately the distal ends of the leaf bases take on a strong hyponastic curvature,

so that the trunk is invested in an armour of leaf bases each bearing its downwardly-directed leaf blade, more or less of which is ultimately broken off by accident or burnt away by fire. The downwardly-directed leaf bases are well shown in pl. ii., fig. 2, where they are viewed from above, cut obliquely in the transverse section of the stem. The course of the leaf bundles within the stem offers points of morphological interest, but they are not germane to the questions at issue.

The individual leaf is seen to have a long terete blade some 75 cm. in length and only 1·25 mm. in cross section, which is almost square. At the proximal end it passes into an enlarged leaf base, expanded laterally into wings. The base is some 5 cm. long and about 1·4 cm. in its greatest width, while the thickness is at most about 4 mm. (text fig. 1). In section it has a horizontally elongated diamond shape, but at the proximal end the wings become much thinner, almost membranous. The leaf is at first attached by the whole base, but as it gets older the wings become free from the stem cortex, as will be seen below. When young the leaf base is whitish-yellow and has a highly-polished appearance, being slightly viscid to the touch. As it becomes older the colour is more yellowish and small flakes of resin appear upon it. When old the leaf base becomes very hard and tough, loses its sheen, and takes on a brown colour, often being coated with resin. The leaf bases remain living for a much longer period than the laminas, probably for several years, but by the time they have attained a horizontal position with regard to the trunk they are dry and dead.

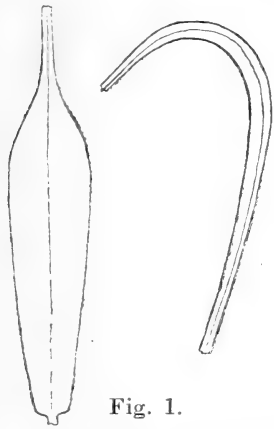

Fig. 1.

Front and side view of leaf base of *Xanthorrhoea quadrangulata* showing wings and marked hyponastic curvature of the old leaf base. ×½.

The longitudinal section of the stem (pl. i., fig. 2) is instructive, for it shows that the quantity of resin accompanying the leaf bases increases as one passes basipetally down the stem. This appearance, coupled with certain other observations, leads at first to the conclusion that the resin was secreted by the leaf bases themselves. If the figure be carefully examined there is seen to be a denser layer of tissue immediately below the periphery of the stem. This is shown

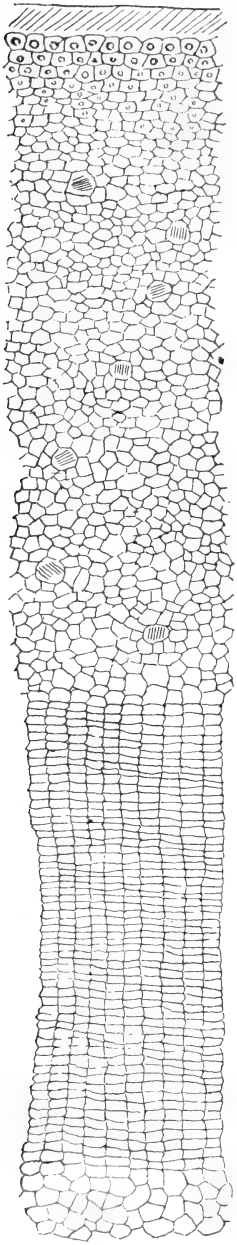

Fig. 2.

Diagrammatic transverse section of stem extending from region of meristem outwards to the resin layer. For further description see accompanying text.

most clearly at **A**, and is seen in greater detail in pl. iii., fig. 1. A similar tissue was observed in all sections of the stem, even those near to the base (see pl. iii., fig. 2, which is a portion of pl. ii., fig. 1, enlarged).

Microscopic Structure.

A microscopical examination of the leaf base shows that it is bounded by layers of cellulose fibres. The epidermis is strongly sclerized except for occasional thin-walled cells, which show large granular nuclei. Except for these cells there is no tissue of a glandular nature in the leaf base, and even if these cells be unicellular epidermal glands it is very doubtful if they could secrete the quantity of resin found about the stems, especially when it is remembered that at the lower end of the stem the leaf bases are dead and even decayed away, while it is there the resin sheath is thickest.

A careful examination of the peripheral region of the stem was therefore made, this region having shown, as mentioned above, a point of special interest. Text fig. 2 represents a transverse section of the outer layers of the stem taken near the base. Below the investing layer of resin are several layers of parenchyma cells showing large granular nuclei. Still deeper is a wide parenchymatous region containing numerous cells with raphides. This region passes into a broad zone of cambium cells, which is succeeded internally by the ground parenchyma of the stem through which the vascular bundles run.

The development of secondary meristems is rare in monocotyledonous plants, but it is found in a few genera of the Liliaceae, to which family *Xanthorrhoea* belongs. In these cases the

cambium is concerned with the formation of new vascular bundles. It has clearly no such function here. Certain monocotyledons also develop a peripheral cork cambium, but the meristem tissue in *Xanthorrhoea* cannot have that function since there is a zone of living tissue outside it, nor does any part of the stem yield the characteristic reactions of suberin. The purpose of the meristem seems, therefore, to be to add to the cortical cells lying outside it. But the cortical zone does not increase appreciably in thickness as the stem gets older. If, then, the cambium adds to it on the inside, it is clear that cells must be sloughed on the outside.

A careful examination of the outermost region of the cortex, at the point at which it abuts on the resin zone, shows that the layer of delimitation is irregular. The cortex cells here have large granular nuclei and have every appearance of secretory cells. In many cases they show large amounts of plastic contents, the nature of which could not be determined. There is no recognisable epidermis to be seen.

Text fig. 3 is a camera lucida drawing of a portion of this region, and shows that the cells are not only in contiguity with the resin along an irregular line, but that similar cellular structure to the outer cortex cells can be discerned embedded in the resin. The inference, therefore, is that the resin is formed chiefly as an intra-cellular secretion of the peripheral cells of the stem which are thus cut off. The cortex, however, is replenished by the activity of the cambium mentioned above, so that it does not diminish in thickness. Physiologically, the resin may serve to cement the persistent leaf bases together so protecting the stem from injury, the persistent armour of leaf bases taking the place of the bark of most plants. Even if the leaf bases decay away there is left a layer of resin, as at the base of the trunk investigated, protecting the living parenchyma of the outer cortex.

Examination of the Resin Residues.

It is well known that the resin is completely soluble in alcohol, also in KOH solution. If, however, it is formed as an intracellular secretion the walls of the cells themselves should be found in the resin and left as a residue when the latter passes into solution. A large number of fragments of apparently pure resin from different parts of the plant were examined as follows. The resin was removed as completely as possible with absolute alcohol and the residue examined in cedar-wood oil. In the majority of cases the resin gave a residue that showed fragments of cellular tissue similar in

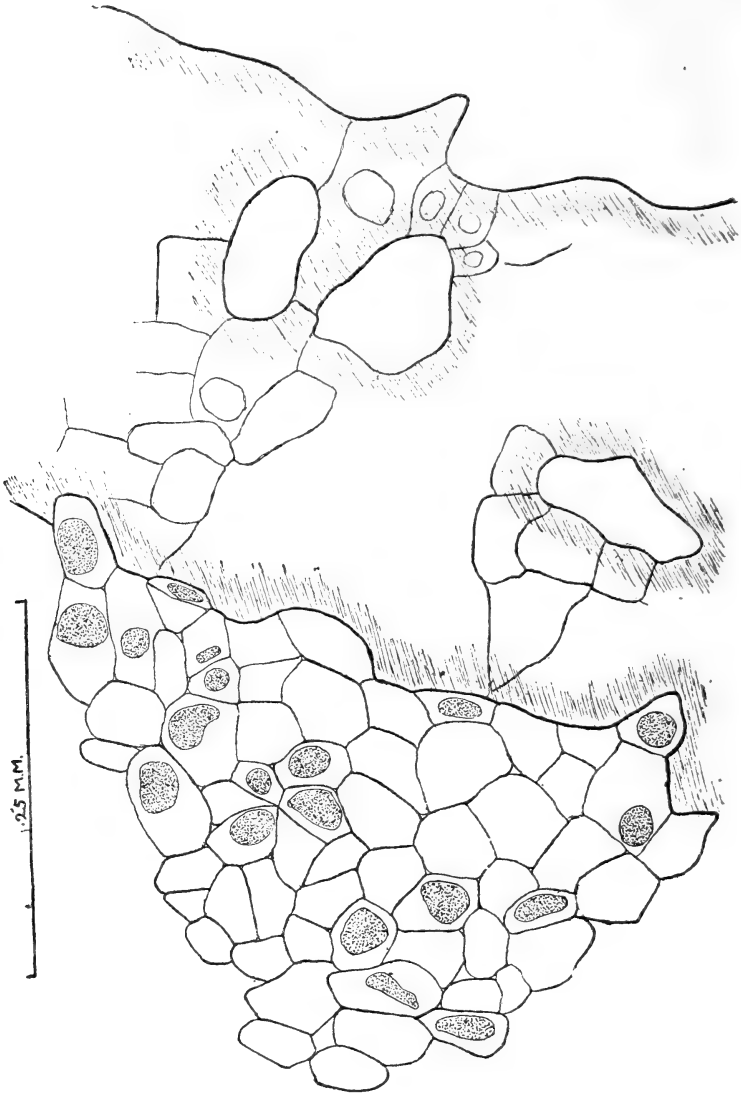

Fig. 3.

Transverse section of stem showing peripheral cells of cortex with their enlarged nuclei. The irregular abutment of cortex on the resin layer is shown, also several cells similar to those of cortex embedded in the resin.

Camera lucid outlines from a section through fresh material.

appearance to that of the outermost layers of the cortex. In one experiment a fragment some 1 × 1 × ·5 cm. from the investing layer of resin near the base of the trunk was treated with alcohol and all the resin removed. The residue was a solid mass of cellular structure the size and shape of the original fragment. Many of the thin flakes of resin to be found between the leaf bases in the upper region of the stem also showed fragments of cellular structure.

A small feature of additional interest has been found in examining these residues. In many cases, in addition to the cortical cells of the stem, there was present a greater or less amount of a thin septate fungus mycilium. No sign of spores or fructification has been noted, but it appears as if the fungus was saprophytic upon the dead leaf bases or even upon the cells occluded in the resin.

In further confirmation of the hypothesis that the resin is, in the main, an intracellular secretion of the cortical cells of the stem, a number of fragments of Kangaroo Island grass tree (*X. Tatei*) "gum," from a commercial source, was selected for examination. It was quickly recognized that amongst the fragments were two kinds, differing in appearance. The resin in some cases was clear and translucent, in the other it appeared much denser, almost opaque, when held up to the light. The residues of samples of each kind were examined as above. The transiucent resin showed many cells similar to those found in the resin of *X. quadrangulata*. The denser resin also showed a few such cells, but in this case the bulk of the residue was a mass of almost pure fungus hyphae.

Conclusions.

The resin of *Xanthorrhoea quadrangulata* is an intracellular secretion, principally of the peripheral cortical cells of the stem. The resin so formed is moulded by pressure between the persistent leaf bases clothing the stem, and, at sun heat becoming viscous, flows to a certain extent, destroying the original cellular matrix, but still retaining fragments, as can be seen by an examination of the residues of alcoholic solutions of the "gum." It follows, therefore, that there is little likelihood of any method of collecting the resin other than by destroying the tree. Any method of stripping the trunk, assuming one could be devised that should be commercially possible, must kill the plant, since it would expose unprotected parenchyma tissues to the atmosphere and open the way for fungal and animal attacks.

DESCRIPTION OF PLATES.

Plate I.

Fig. 1. Photograph of a plant of *X. quadrangulata*. Numerous adventitious roots are noticeable. Above them a region of stem protected only by a resin sheath. Then follows a zone protected by the persistent leaf bases, the ends of which were charred by fire. Above this again the laminas of the leaves were persistent, though dry and dead; since they were pendent owing to the strong reflexion of their bases they were cut away to expose the trunk. The leaves remaining were all green and functional. Diameter of trunk immediately above roots, 14 cm.

Fig. 2. Longitudinal section of trunk at apex. The increasing accumulation of resin at the leaf bases is noticeable as one descends the trunk, particularly on the right hand side. At A the cambium zone in the cortex is clearly seen.

Plate II.

Fig. 1. Transverse section of trunk about 4 cm. above the point of emergence of the uppermost roots, in the region of the stem protected by the resin layer only. The majority of the leaf traces are cut transversely; a few can be seen passing out through the stem, simulating the appearance of medullary rays. The cambium zone and cortex is best seen on the left of the figure at the bottom. Diameter of the stem, about 15 cm.

Fig. 2. Transverse section of stem at a point some 5 cm. above that shown in the previous figure, passing through the region protected by the downward-projecting leaf bases at the top of the figure. These are seen cut in oblique section and cemented together by resin. Diameter of section (stem and leaf bases), about 20 cm.

N.B.—Figs. 1 and 2 of this plate are photographed on different scales. The diameter of the stem in each case is approximately the same—about 12 cm.

Plate III.

Fig. 1. Portion of longitudinal section shown at A, pl. i., fig. 2, photographed on a larger scale. The leaf traces in the ground tissue of the stem, the cambium, and cortex are clearly shown. The ruddy brown of the resin shows almost black in contrast to the white of the cortex at the proximal ends of the leaf bases. $\times \frac{1}{2}$.

Fig. 2. Portion of section shown in pl. ii., fig. 1, photographed on a larger scale. The resin sheath with its irregular abutment on the cortex is clearly seen. The ends of several leaf traces will be noticed, though the leaves themselves and leaf bases have long rotted away. The cambium is best seen at C.

AUSTRALIAN HYMENOPTERA: PROCTOTRYPOIDEA. NO. 4.

By ALAN P. DODD.

[Read May 11, 1916.]

Family PLATYGASTERIDAE.

DOLICHOTRYPES, Crawford and Bradley.

A peculiar genus, formerly containing only the type species, *D. hopkinsi*, Craw. and Brad., from North America.

DOLICHOTRYPES IDARNIFORMIS, n. sp.

♀. Coal-black; coxae concolorous, the legs reddish-yellow, the femora and apical half of posterior tibiae dusky; antennal scape red, suffused dusky at apex, the pedicel and funicle joints a little suffused with red. Head transverse; with fine, dense, raised, polygonal reticulation; eyes large, bare; ocelli rather wide apart, the lateral ones somewhat nearer to the eye margins than to the median ocellus. Thorax convex dorsad; the pronotum and mesonotum with sculpture similar to that of the head; scutum long, distinctly longer than greatest width, the parapsidal furrows delicate, approaching each other caudad, not quite attaining anterior margin; scutellum convex, with a short blunt tubercle or projection caudad, with silvery pubescence. Abdomen composed of five visible segments: segments 4-6 forming a long linear stylus, longer than rest of body, the sixth somewhat longer than fifth, which is longer than the fourth; second (first body) segment and third convex above and below, stout; second smooth and shining, about one-third longer than wide, the third transverse, 3-6 with fine surface sculpture. Legs slender; tarsi 5-jointed; proximal joint of posterior tarsi almost as long as other four united. Forewings long, broad, the apical margin broadly rounded; hyaline; marginal cilia absent, the discal cilia practically so; wholly without venation. Antennae 10-jointed; scape long and slender; pedicel longer and a little wider than funicle joints, over twice as long as wide; first funicle joint small, one-half longer than wide; second distinctly longer; third shorter than second, as long or slightly longer than first; fourth slightly longer than wide; club abrupt, 4-jointed, the joints fully as long as wide, the first very slightly the longest. Length, to apex of stylus, 2·75 mm.; to base of stylus, 1·20 mm.

Hab.—Queensland: Cairns district. One female on foliage of sugarcane, June, 1915 (A. P. Dodd).

Type.—I. 5403, South Australian Museum. A female on a tag, antennae and forewing on a slide.

Polygnotus australis, n. sp.

♀. Shining-black; coxae concolorous, the legs otherwise bright golden-yellow, also the antennal scape, the pedicel and funicle joints a little suffused dusky, the club brown; femora and tibiae slightly dusky in centre. Head transverse, as wide or slightly wider than the thorax; occiput finely circularly striate; viewed from in front the head is distinctly wider than long; frons with exceedingly fine, dull surface sculpture; eyes large, bare. Thorax convex dorsad; scutum a little longer than greatest width, with fine, dense, polygonal, scaly sculpture; parapsidal furrows delicate but complete; scutellum circular, well separated from the scutum, smooth except for sparse whitish pubescence; metanotum very short at meson; thorax stout. Abdomen oval; widest near posterior margin of second segment; from lateral aspect somewhat convex above, less so beneath; first segment about twice as wide as long, strongly striate; second occupying about one-half of surface, finely striate for basal half, the apical half alutaceous. Forewings attaining apex of abdomen; hyaline; broad; discal cilia fine and sparse. Antennae 10-jointed; scape long and moderately stout; pedicel one-half longer than wide; first funicle joint very small, distinctly narrower than preceding or succeeding joint, cupuliform, as long as wide; second and third a little longer than wide; club 5-jointed, somewhat wider than funicle, joints 1-4 somewhat longer than wide, the fifth longer, the first cupuliform. Length, 1 mm.

♂. Like the female, but flagellar joints all darker, club not distinct, the second and third funicle joints not distinctly narrower, and the first club joint not cupuliform.

Hab.—Northern Territory: Darwin. Many specimens of either sex, labelled "Bred from galls on buds of *Careya australis*, 17/10/14, G. F. Hill."

Type.—I. 5404, South Australian Museum. Two females on a tag, a male and female on a slide.

Sactogaster saccharalis, n. sp.

♀. Shining-black; coxae and hind femora and tibiae dusky-black, other femora and tibiae slightly dusky, the rest of the legs bright golden-yellow, also antennal scape, the funicle dusky, the pedicel and club black. Head very transverse; ocelli rather far apart, the lateral pair separated from the eye margins by more than their own width; with fine, very

dense polygonal, scaly sculpture. Pronotum and scutum with similar sculpture to the head; scutum distinctly longer than its greatest width; parapsidal furrows feeble, hardly discernible, approaching rather close together posteriorly; scutellum rather short, produced into a thorn at apex, this not as long as body of scutellum, covered with short, dense, silvery pubescence, without sculpture. Abdomen, viewed from above, as long or slightly longer than the thorax, the second segment smooth and occupying over one-half of surface, the remainder with fine sculpture and narrowed, the third shortest; viewed from the side, the second segment is deeply inflated ventrad, the rest very thin and curved somewhat downwards. Tarsi 5-jointed; basal joint of posterior tarsi over twice length of second. Forewings reaching somewhat beyond apex of abdomen; moderately broad; hyaline; discal cilia very fine, not very dense; without venation. Antennae 10-jointed; scape as long as pedicel and funicle joints united; pedicel one-half longer than wide; funicle joints narrower, the first and third almost subequal, no longer than wide, the second twice as long, the fourth wider than long; club distinct, 4-jointed, first joint rather small, 1-3 distinctly wider than long. Length, 1 mm.

Hab.—Queensland: Cairns district. Frequently taken on leaves of sugarcane.

Type.—I. 5405, South Australian Museum. A female on a tag, a female on a slide.

Family BELYTIDAE.

Aclistoides, n. g.

♀. Head transverse; the eyes large, bare. Pronotum distinctly visible, its latero-anterior angles acute; parapsidal furrows deep and distinct anteriorly, vanishing posteriorly; scutellum with a very large, deep, circular fovea at base; metanotum pilose, without teeth or spines. Petiole long and slender, several times as long as wide, its dorsum faintly carinate; convex above from lateral aspect; body of abdomen in three portions, caused by segment 3 (second body segment) being retracted at base and apex and 4 retracted at base, the three portions consisting of segments 2 (first body segment), 3, and 4-7 respectively; 4-7 appearing as one through their delimiting sutures being very faint; 2 one-half longer than petiole; 3 about one-third length of petiole, somewhat wider than long; 4 one-third longer than 3; 5 and 6 very short; 7 conical, a little shorter than 4. Legs normal, slender, the femora clavate. Forewings normal, ample; marginal vein long, less than one-third length of submarginal,

the stigmal short, perpendicular; no radial cell; basal vein a distinct brown line, the median and recurrent very faint ones. Hindwings without a closed cell. Antennae 15-jointed, scape slender; flagellum without a distinct club, the apical joints feebly thickened.

The structure of the abdominal segments, in conjunction with the wing venation, readily separates the genus. Allied with *Stylaclista*, Dodd, but differs in the form of the abdomen.

Type.—The following species.

ACLISTOIDES RETRACTUS, n. sp.

♀. Black, the apical abdominal segment ferruginous; coxae fuscous, the legs brownish-yellow, the femora and posterior tibiae more or less dusky; antennae black, the apical joint pale lemon-yellow. Head, scutum, and scutellum smooth, shining, also the abdomen, the segments after 2 with scattered, long, fine setae. Forewings long and broad; subhyaline; discal cilia coarse and dense; venation fuscous; stigmal vein boot-shaped, with the apex pointing distad. Scape slender, barely as long as the three following joints united; pedicel nearly twice as long as wide; first funicle joint one-half longer than pedicel, second about as long as pedicel, the others shortening, the penultimate as wide as long, the last joint almost twice as long as preceding. Length, 2·50 mm.

Hab.—Queensland: Cairns district. One female, lowland jungle, October, 1915 (A. P. Dodd).

Type.—I. 5406, South Australian Museum. A female on a tag, antennae and forewings on a slide.

PANTOLYTOIDEA PSEUDOCLAVATA, n. sp.

♀. Black, the thorax and petiole very deep-red; legs golden-yellow; first seven antennal joints red, the next five black, the last three contrasting intense lemon-yellow. With the general structure of the other species of the genus. Head much more transverse than in the other species: perpendicular from ocelli to antennal prominence, the latter thus much less distinct from dorsal aspect. Abdomen rather more than twice as long as greatest width. Forewings uniformly lightly infuscate; stigmal vein fully one-half as long as the marginal. Antennae without a distinct club, the last eight joints only slightly thickened; pedicel twice as long as wide; first funicle joint much longer, four times as long as wide, 2-5 shortening, the fifth not twice as long as wide; 6-12 very gradually shortening, the twelfth quadrate. Length, 2·40 mm.

Hab.—Queensland: Cairns district. Two females, jungle, August, 1915 (A. P. Dodd).

Type.—I. 5407, South Australian Museum. A female on a tag, antennae and forewings on a slide.

PANTOLYTOIDEA BIFOVEATA, n. sp.

♀. Dull-black; legs wholly bright reddish-yellow; antennal scape black, pedicel and funicle red, club black. Head rather transverse, as in *pseudoclavata*. Scutellum at base with two circular foveae. Petiole one-half longer than wide, carinate, its sides straight or nearly so; body of abdomen wider than thorax; about as long as head and thorax united: faintly depressed at extreme base, with a short median carina and shorter lateral ones; twice as long as its greatest width; apical segment shorter than two preceding united. Marginal vein quadrate or nearly so, somewhat shorter than the stigmal. Pedicel one-half longer than wide, the funicle joints narrower, first one-half longer than wide, the others shortening, 5-7 distinctly wider than long; club 6-jointed, first joint narrower than others, 1-5 much wider than long, the last joint as long as two preceding united. Length, 2 mm.

Hab.—Queensland. Cairns district, 1,200 feet. One female, jungle, July, 1915 (A. P. Dodd).

Type.—I. 5408, South Australian Museum. A female on a tag, antennae and forewings on a slide.

The two foveae at base of scutellum readily distinguish the species.

Family DIAPRIIDAE.

TRICHOPRIA GIRAULTI, n. sp.

♀. Brownish-black, the petiole, legs, and antennae (except the club) reddish-yellow; antennal club black. Head normal, subglobose; with a few scattered setae. Thorax normal; scutellum at base with one shallow fovea, without a median carina; metanotum with a subacute triangular raised scale medially at base. Petiole one-half longer than wide, carinate, and with distinct pubescence; body of abdomen raised from petiole, stout, pointed conic-ovate, the second segment fully twice as long as following united. Forewings attaining apex of abdomen; moderately broad; subhyaline; marginal cilia long, the longest equal to one-fourth greatest wing width; venation terminating in a triangular marginal vein at one-third wing length. Antennae 12-jointed; scape slender; pedicel twice as long as wide, the funicle joints somewhat narrower, the first thrice as long as wide, 2-5 almost subequal, about twice as long as wide; club 5-jointed,

first joint narrower than others, a little longer than wide, 2-4 a little wider than long, the fifth one-half longer than wide. Length, 1·75 mm.

Hab.—New South Wales: Brooklyn. One female, labelled "Sweeping grass, etc., November 18, 1914, A. A. Girault."

Type.—I. 5409, South Australian Museum. A female on a tag, antennae and forewings on a slide.

TRICHOPRIA QUADRATA, n. sp.

♀. Dull-black; the tegulae, petiole, all of legs, and antennae (except the club) reddish-yellow. Head, dorsal aspect, quadrate, as long as wide; ocelli situated at half its length; eyes rather small, situated far forward and almost against antennal prominence. Thorax normal; scutellum without a median carina, at base with a large shallow fovea. Petiole not much longer than wide; body of abdomen well raised from petiole, rounded posteriorly, the second segment over thrice as long as following united. Forewings attaining apex of abdomen; moderately broad; subhyaline; marginal cilia rather long; venation yellow. Antennae 12-jointed; pedicel barely twice as long as wide; first funicle joint hardly narrower, fully twice as long as wide; second a little longer than wide, the sixth slightly wider than long; club abrupt, 4-jointed, joints 1-3 about subequal, a little wider than long, the fourth one-half longer than wide. Length, 1·75 mm.

Hab.—New South Wales: Muswellbrook. One female, labelled "Sweeping native flora in park, October 26, 1914, A. A. Girault."

Type.—I. 5410, South Australian Museum. A female on a tag, antennae and forewings on a slide.

PHAENOPRIA GLOBICEPS, n. sp.

♀. Black, the antennae concolorous; legs dusky-black, the trochanters, base and apex of the tibiae, and the tarsi golden-yellow. Head, dorsal aspect, globular, as long as wide; eyes situated far forward and almost against antennal prominence. Thorax slender, twice as long as greatest width; smooth and shining; scutellum very gently convex, without a median carina, somewhat depressed at base but without a basal fovea; metanotum without a raised scale at base. Petiole no longer than wide, pubescent; body of abdomen slender, a little longer than thorax, pointed conic-ovate, the second segment twice as long as the following united. Forewings attaining apex of abdomen; moderately broad; hyaline; venation dark, terminating in a triangular marginal vein at basal third of wing. Antennae 12-jointed; scape slender;

pedicel twice as long as wide, the funicle joints narrower, the first twice as long as wide, the others gradually shortening, the seventh as long as wide; club abrupt, 3-jointed, first joint as long as wide, the second a little wider than long, the third twice as long as preceding. Length, 1·50 mm.

Hab.—New South Wales: Brooklyn. One female, labelled "Sweeping grass, etc., November 18, 1914, A. A. Girault."

Type.—I. 5411, South Australian Museum. A female on a tag, antennae and forewings on a slide.

Bothriopria, Kieffer.

Synonym, *Polypria*, Dodd: *Ante*, 1915, p. 410.

The finding of the species *connectens* reduces the genus *Polypria* to synonymy with *Bothriopria*, and the type species, *nigriventris*, Dodd, must be considered as merely a diverse form of the latter genus.

Bothriopria connectens, n. sp.

♀. Like *nigriventris*, but the legs wholly golden-yellow; thorax brighter reddish, the metathorax and venter black; penultimate antennal joint not yellowish; vertex of head smooth except for a very few rather large punctures far laterad; medium lobe of scutum without depressions, the lateral lobes plainly depressed; foveae of scutellum less large; pedicel a little longer and wider than first funicle joint; blotch beneath marginal vein very indistinct. Length, 2 mm.

Hab.—Queensland: Cairns district. One female, jungle, August, 1915 (A. P. Dodd).

Type.—I. 5412, South Australian Museum. A female on a tag, antenna and forewings on a slide.

Bothriopria nigerrima, n. sp.

♀. Black; antennae wholly concolorous; legs concolorous, the base and apex of trochanters, apex of tibiae, most of anterior tibiae, and anterior tarsi, ferruginous, the other tarsi suffused reddish. Head normal; smooth, with a very few scattered setae. Scutum without depressions, the parapsidal furrows distinct and complete, with several small setigerous punctures on either side; scutellum with two large oval foveae at base, situated rather obliquely to each other, the lateral foveae narrow and obscure, the posterior margin foveate; metanotum rugose, with a plain median carina, the posterior margin concave. Petiole one-third longer than wide, with several strong carinae dorsad; body of abdomen no longer than thorax, rounded posteriorly, the second segment

nearly thrice as long as the following united. Forewings long and broad; subhyaline; venation fuscous; marginal vein stout, barely twice as long as wide, the stigmal shorter, the basal well-marked, the median hardly indicated. Scape normal; pedicel twice as long as wide; first funicle joints somewhat narrower, somewhat over twice as long as wide, the second and third subequal, a third longer than wide, the fifth a little wider than long; club not differentiated, hardly wider than funicle, the joints (except the last) a little wider than long. Length, 3 mm.

Hab.—New South Wales: Brooklyn. One female, labelled "Sweeping grass, etc., November 18, 1914, A. A. Girault."

Type.—I. 5413, South Australian Museum. A female on a tag, antenna and forewings on a slide.

Nearest to *victoriae*, Dodd, but the legs are darker, the metanotum does not bear a raised scale at base, and the foveae at base of scutellum are situated obliquely to each other.

SPILOMICRUS GRACILIS, Dodd.

One female, jungle, 1,200 feet, Cairns district, July, 1915 (A. P. Dodd).

Family CERAPHRONIDAE.

CERAPHRON ERYTHROTHORAX, n. sp.

♀. Of stout form. Head and abdomen black; thorax rich ochreous, the sides and venter more or less blackish, also centre of scutellum posteriorly; legs golden-yellow, the intermediate coxae darker: antennae black, the scape yellow at base. Vertex of head rather broad; eyes large, pubescent; face well depressed for its entire length, with a few transverse obscure rugae; head otherwise smooth, except for scattered setae. Thorax stout, its dorsum somewhat convex; without sculpture, but with whitish pubescence, this very sparse in centre of scutellum; median groove of scutellum distinct; scutellum plainly longer than wide; post-scutellum with a distinct blunt central spine or tooth; latero-posterior angles of metanotum with blunt prominences. Abdomen stout, broad; no longer than head and thorax united; acute and upturned at apex; with a few striae at base, smooth for the rest; second segment occupying most of surface. Forewings long; broad, rather broadly rounded at apex; a little infuscate; discal cilia very dense, fine; venation yellowish; marginal vein barely one-fourth as long as the long stigmal, the latter curved, its apex distant from the costa by nearly

one-fourth its own length. Antennal scape rather stout, nearly as long as next three joints combined; pedicel fully twice as long as wide; the first funicle joint one-half longer than pedicel, the second a little shorter than pedicel, the fourth as wide as long, the fifth rather abruptly larger than fourth, 5-7 as long or a little longer than wide, the last joint nearly twice as long as wide. Length, 1·70 mm.

Hab.—Queensland: Cairns district. One female, jungle, August, 1915 (A. P. Dodd).

Type.—I. 5414, South Australian Museum. A female on a tag, antenna and forewings on a slide.

A striking and distinct species.

Ceraphron pulcher, Dodd.

A female, which could not be distinguished from this species, was captured by sweeping on edge of jungle, 1,200 feet, Cairns district, February, 1915 (A. P. Dodd).

Megaspilus scabriceps, n. sp.

♀. Of stout form. Golden-brown, the abdomen a little dusky; eyes and ocelli black; antennal scape yellow, the pedicel suffused with yellow, the rest dark fuscous. Head transverse, as wide or slightly wider than the thorax; finely rugulose or scabrous; eyes not large, pubescent; ocelli very close together; mandibles large, bidentate, the outer tooth long. Thorax stout; median and parapsidal furrows of scutum complete and distinct; scutum with scattered setigerous pin-punctures, the median lobe appearing faintly alutaceous, the parapsides shining; scutellum longer than wide, smooth, impunctate; post-scutellum with a stout spine. Abdomen no longer or wider than the thorax; not twice as long as greatest width; the apex upturned; second segment occupying slightly over half of surface, striate at base, smooth for the rest; remaining segments with fine scattered pubescence. Forewings attaining apex of abdomen; very broad; rather deeply infuscate; stigma semicircular, the stigmal vein nearly twice its length. Scape moderately stout; pedicel one-third longer than greatest width; first funicle joint rather longer and wider, cupuliform, one-third longer than greatest width; 2-8 almost subequal, nearly twice as wide as long, the last joint nearly twice as long as wide. Length, 1·75 mm.

Hab.—Queensland: Cairns district, 1,700 feet. One female, jungle, July, 1915 (A. P. Dodd).

Type.—I. 5415, South Australian Museum. A female on a tag, antennae and forewings on a slide.

CONOSTIGMUS UNILINEATUS, Dodd.

Lygocerus unilineatus, Dodd: *Ante*, 1915, p. 452.

Two females, three males, jungle, 1,300 feet, Cairns district, July, 1915 (A. P. Dodd). Foveae near base of abdomen subobsolete in all these specimens.

♂. Antennae black, the scape and pedicel golden-yellow; scape rather stout; pedicel short and stout; funicle joints long and slender, the first longest, a little shorter than the scape, the others very slightly shortening toward apex.

LYGOCERUS, Foerster.

It would seem that this genus can be separated from *Conostigmus*, Dahlbom, only by the male antennal characters, and that the females cannot be distinguished. The discovery of the male of *unilineatus* proved that species to belong to *Conostigmus*, and it is probable that the other Australian species of *Lygocerus* founded on female specimens—namely, *splendidus*, Dodd, *aterrimus*, Dodd, and *albovarius*, Dodd—should be referred to the former genus. Whether the two genera should be regarded as separate is questionable.

Family BETHYLIDAE.

EUPSENELLA DIEMENENSIS, n. sp.

♀. Shining-black; the coxae and femora concolorous, the tibiae and tarsi deep ferruginous; antennae wholly yellow, somewhat suffused dusky. Head a little wider than long, dorsal aspect; eyes large, bare. Pronotum a little longer than the scutum; scutum with complete parapsidal furrows, the lateral lobes with a fine longitudinal groove that fails anteriorly; scutellum as long as the scutum, without an impression at base; head, pronotum, scutum, and scutellum with fine, impressed, polygonal, scaly sculpture, the scutellum with also a very few scattered pin-punctures; metanotum not twice as long as the scutellum, finely transversely rugose and with a median carina. Abdomen as long as the thorax, smooth, or nearly so. Anterior femora distinctly swollen. Forewings long and broad; faintly infuscate; venation deep-brown; two closed basal veins; areole rather small, but plainly longer than wide; cubital cell one-half longer than the closed radial, which is nearly twice as long as the stigma; radial vein somewhat recurved. Antennae 13-jointed; scape stout, about twice as long and as wide as the pedicel; pedicel as long as first funicle joint, which is two-thirds longer than its greatest width, the others very gradually shortening, the penultimate a little longer than wide, the ultimate as long as the first. Length, 3·40 mm.

Hab.—Tasmania: Mount Wellington (A. M. Lea, unique).

Type.—I. 5416, South Australian Museum. A female on a tag, head and forewings on a slide.

Goniozus girault, n. sp.

♀. Black; coxae and femora deep-brown, the tibiae and tarsi testaceous; antennae wholly testaceous. Head, dorsal aspect, a little wider than long; eyes bare. Head, pronotum, scutum, and scutellum with fine polygonal scaly reticulation; pronotum distinctly longer than the scutum, the latter without parapsidal furrows, but rather far laterally with a fine carina that runs from posterior margin for two-thirds its length; scutellum with an impressed line at base, at either latero-anterior angle with a small fovea; metanotum rather long, finely obliquely reticulate in raised lines, the median line of the sclerite smooth and shining. Abdomen no longer than the thorax, smooth or nearly so. Anterior femora much swollen. Forewings ample; faintly infuscate; venation yellow, the stigma and prostigma brown; stigmal vein long, twice as long as the stigma, hardly curved; basal vein not straight, angled at one-third its length, the posterior portion directed obliquely backwards, and thus the anterior margin of the median cell is distinctly longer than its posterior margin; basal vein at angle with a distal branch which is about half as long as itself; basal vein joining the prostigma. Antennae 13-jointed: scape stout, twice as long as the pedicel, which is as long as the second funicle joint, one-half longer than wide, a little longer than the first, the third subequal to the second, the others gradually shortening, the penultimate a little longer than wide, the ultimate about as long as the sixth. Length, 3·40 mm.

Hab.—Queensland: Yungaburra, 2,500 feet. One female, jungle, December 30, 1911 (A. A. Girault).

Type.—I. 5417, South Australian Museum. A female on a tag, antennae, head, and forewings on a slide.

Goniozus glabriscutellum, n. sp.

♀. Black; the coxae concolorous, the femora a dark-brown, the tibiae and tarsi testaceous; antennal scape and apical seven joints fuscous, the rest clear testaceous. Head, dorsal aspect, as long as greatest width; head, pronotum, and scutum with very obscure, polygonal, scaly sculpture, almost obsolete, and with scattered punctures; scutellum glabrous, and laterad with a very few scattered punctures; scutum from posterior margin with a short abbreviated groove rather far

laterad: scutellum at either latero-anterior angle with a narrow oblique fovea; metanotum finely obliquely reticulate in raised lines, with a triangular smooth mesal path at basal half, the point of the triangle posteriorly, the triangle twice as long as width at base. Abdomen normal. Anterior femora much swollen. Forewings ample; hyaline; venation yellow, the prostigma and stigma dusky; venation much as in *girault*i. Pedicel hardly one-half longer than wide, rather less than half as long as the scape; first funicle joint distinctly longer than the pedicel, twice as long as the greatest width, the second distinctly shorter than the first, the remainder becoming smaller towards apex, the apical joint as long as the second but not as wide. Length, 3·30 mm.

Hab.—Queensland: Longreach (A. M. Lea, unique).

Type.—I. 5418, South Australian Museum. A female on a tag, antenna and forewing on a slide.

RHABDEPYRIS ERYTHROGASTER, n. sp.

♀. Black; the abdomen, except at base dorsad, bright orange-red; coxae and femora dark-brown, the tibiae paler, the tarsi testaceous; antennae wholly deep-brown. Pronotum distinctly longer than the scutum, with numerous scattered punctures and very faint, almost obsolete, surface reticulation; scutum finely subtransversely lineolated, and with scattered small punctures, the parapsidal furrows complete, the lateral lobes with a half-complete groove from posterior margin; scutellum with fine surface lineolation, with a few punctures laterad, and a deep-impressed transverse curved groove at base: metanotum with five longitudinal carinae, of which the median one attains the carinated posterior margin, the next pair nearly so, the outer pair distinctly not so, between these carinae strongly transversely lined, outside the carinae finely transversely lineolate. Abdomen a little longer than the thorax. Forewings ample; moderately deeply infuscate; venation yellow-brown; stigma rather small; stigmal vein very long, as long as the costal; median and submedian cells about subequal, the basal and transverse veins oblique, forming at their juncture an angle of about 90°; submedian and submarginal veins of equal length. Antennae 13-jointed; scape fully twice as long as the pedicel; pedicel and basal funicle joints cupuliform; pedicel one-half longer than wide, slightly longer than second funicle joint, the first shorter and somewhat wider than long, the second longest, the remainder shortening, but all a little longer than wide. Tarsal claws simple, or practically so. Length, 3·90 mm.

Hab.—South Australia: Adelaide. One female on a card with an ant, *Ectatomma*, sp., collected by A. M. Lea.

Type.—I. 5419, South Australian Museum. A female on a tag, antennae, forewings, and two tibiae and tarsi on a slide.

Family DRYINIDAE.

Paradryinus speciosus, n. sp.

♀. Mesothorax and metathorax black; head and prothorax clear-ochreous, the former dusky in centre of frons; neck of pronotum with a dusky-black patch on either side of meson, also a large blackish oblique patch on either side of meson of pronotum at about half its length; abdomen dark-brown; becoming ochreous toward apex; forelegs testaceous, the femora, tibiae, and basal tarsal joint suffused somewhat dusky; intermediate and posterior legs mostly dusky-black, the posterior coxae less so, the tarsi brownish, their first joint and second more or less, also base of their tibiae white; edge of clypeus white; antennae dusky, joints 1, 2, 6, and 7 testaceous. Head with rather strong surface rugosity. Pronotum subconcentrically rugose; the scutum, scutellum, and postscutellum more strongly longitudinally rugose, and with scattered fine whitish pubescence; parapsidal furrows evident; postscutellum more than half length of scutellum; the long anterior portion of metanotum strongly rugose-carinate, the posterior portion irregularly rugose. Abdomen smooth, impunctate. Forewings trifasciate, the third band as long as the first and with its proximal margin straight. Length, 5 mm.

Hab.—Queensland: Cairns district. One female, jungle August, 1915 (A. P. Dodd).

Type.—I. 5420, South Australian Museum. A female on a tag.

Very similar to *koebelei*, Perkins, with which species it may be identical, but Perkins says for that species:—"Propodeum reticulately rugose; third band of wing with its inner margin oblique." The colour of the mesothorax and metathorax is very intense, and would hardly appear variable.

Paradryinus aterrimus, n. sp.

♀. Jet-black; tip of abdomen ferruginous; scape suffused reddish, also anterior tarsi, the chelar claw pallid-yellow; mandibles somewhat suffused reddish, also intermediate femora centrally, anterior trochanters apically, and anterior femora slightly. Head, viewed from above, transverse; viewed from in front, triangular, barely wider than long; smooth, shining, with only scattered minute indefinite punctures; vertex straight from eye to eye; a carina runs from front ocellus to antennal depression; occipital cavity

distinctly margined on vertex and sides: maxillary palpi 6-jointed, extending back as far as hind margin of head beneath; labial palpi 3-jointed. Pronotum truncate at anterior margin, with irregular outline (lateral aspect), smooth and shining like the head, except for a meso-posterior hump which is densely irregularly striate; scutum and scutellum smooth and shining; parapsidal furrows wanting; postscutellum about one-fourth as long as scutellum; metanotum long, coarsely reticulately rugose. Abdomen smooth, shining, impunctate or nearly so. Forewings normal; trifasciate; base of wing and a long apical portion, hyaline; first band longest, the second, which is at the basal vein, narrower; all bands dark. Scape two-thirds longer than pedicel; first funicle joint twice as long as second. First joint of anterior tarsi distinctly longer than fourth, the apical joint and chelar claw rather densely spinulose, the anteapical tooth of the latter well-marked. Length, 6·50 mm.

Hab.—Queensland: Cairns district. One female, jungle, August, 1915 (A. P. Dodd).

Type.—I. 5421, South Australian Museum. A female on a tag, antennae, anterior tibiae and tarsi, and forewings on a slide.

The absence of parapsidal furrows, the short postscutellum, and the smooth head, prothorax, and mesothorax are distinctive. The two former characters suggest *Neodryinus*, Perkins, but the pronotum is not divided and the vertex of the head is not concave.

Pseudogonatopus dichromus, Perkins.

One female, on window, Cairns district, October, 1914 (A. P. Dodd).

Family SCELIONIDAE.

Cacellus, Ashmead.

This genus is very similar to *Macroteleia*, Westwood. The females are readily enough distinguished by the presence of the bidentate spine on the metanotum; this character, however, is not present in the male, and hence the males of the two genera can be distinguished with difficulty. *Macroteleia nigriscapus*, Dodd, and *Macroteleia paucipunctata*, Dodd, probably both belong to *Cacellus*. In the descriptions of some of the Australian species the bidentate spine is said to be on the post-scutellum, but this is incorrect.

Cacellus distinctus, Dodd.

Macroteleia distincta, Dodd: Proc. Royal Soc., Qld., vol. xxvi., 1914, p. 100.

CACELLUS PROPINQUUS, n. sp.

♀. Black; legs (including coxae) wholly golden-yellow; scape dusky-yellow, the pedicel and funicle joints fuscous, the club black. Head no wider than the thorax, from dorsal aspect twice as wide as long; with large, dense, umbilicate punctures, confluent on the vertex; lower two-thirds of face (except laterally) smooth and depressed; vertex descending toward occiput, the latter gently concave; eyes large, bare; ocelli large, the lateral pair touching the eye margins. Thorax one-half longer than greatest width; pronotum slightly visible on the sides from dorsal aspect; scutum large, plainly wider than long, the median lobe with dense large punctures, not confluent, the lateral lobes narrow, with fine pin-punctures joined by fine impressed lines; parapsidal furrows deep, complete, foveate; scutellum semicircular, at posterior margin with a row of deep foveae, its surface with scattered punctures, these fine mesally; post-scutellum short, foveate, unarmed; metanotum at base with a rather long semi-horizontal bidentate spine. Abdomen one-half longer than the head and thorax united; sessile, slightly narrowed at base, gradually tapering to apex; segments all longer or as long as wide, the second and third slightly the longest; six segments visible, the first strongly striate, second and third longitudinally confluently rugose-punctate, the sculpture becoming finer on 4-6, the sixth at apex with a small emarginate plate; basal segment without a horn or prominence. Legs long and slender. Forewings almost attaining apex of abdomen; broad; faintly infuscate; venation dark-yellowish; marginal vein a little but distinctly longer than the stigmal, which is moderately long, straight, almost perpendicular, the post-marginal twice as long as the marginal; basal vein very faint, very oblique, the median represented by a thick fuscous line. Scape slender; pedicel a little over twice as long as greatest width; first funicle joint much longer, almost twice as long as the second, which is hardly twice as long as wide, the third a little longer than wide, the fourth plainly wider than long; club compact, 6-jointed, joints 1-5 plainly wider than long, the first distinctly the longest. Length, 4·20 mm.

♂. Like the female, but the lateral lobes of the scutum with large shallow punctures; punctures on scutellum more numerous and of uniform size; metanotum longer, without the bidentate spine, this modified to a pair of median carinae; tarsi darker; abdomen at apex truncate and bispinose. Antennae black, the scape bright-yellow; pedicel one-half longer than wide; first funicle joint nearly twice as long as pedicel, thrice as long as wide, the second distinctly shorter,

2-9 slightly gradually shortening, the ninth one-half longer than wide, the tenth nearly as long as the first.

Hab.—Queensland: Cairns district, 1,200 feet. Three females, two males, around decayed logs in jungle, July, 1915 (G. P. Dodd).

Type.—I. 5422, South Australian Museum. A male and female on a tag, male and female antennae and forewings on slide.

Closely related to both *augustus*, Dodd, and *regalis*, Dodd, but the pedicel and funicle joints in the female are longer in those species; for instance, the second funicle joint is distinctly over twice as wide as long; *regalis* has the scutum and scutellum wholly confluently-punctate, and the plate at apex of abdomen is gently convex, not emarginate; *augustus* has a shorter marginal vein, a dark longitudinal stripe through the wing, and the plate at apex of abdomen strongly concave and bispinose.

Cacellus fuscicorpus, n. sp.

♀. Dull-brown, the head black; legs pale lemon-yellow (including the coxae), also the antennal scape, the pedicel and funicle joints brown, the club black. Vertex and frons with rather dense punctures, these distinctly smaller than in *propinquus*, *regalis*, and *augustus*, and not confluent against the occiput; lower two-thirds of face smooth, except for a row of punctures along the eye margins; cheeks with a very few rather large punctures. Median lobe of scutum at anterior half with rather large dense punctures, the rest of that lobe and all of parapsides with scattered indefinite pin-punctures, also the scutellum; parapsidal furrows deep, complete, foveate; scutellum with a foveate line along anterior and posterior margins; postscutellum unarmed; metanotum at meson with an acute short bidentate spine; scutum and scutellum with fine pubescence. Abdomen slender, rather narrower than the thorax; one-half longer than the head and thorax united; with fine pubescence on sides and toward apex; pointed at apex, with a small truncate plate; segments 2-4 subequal in length, somewhat longer than the first; first segment longitudinally striate, 2-4 densely longitudinally rugose-punctate, the punctuation less distinct on the fifth, the sixth with moderately small and dense punctures. Posterior legs long and slender. Forewings almost attaining apex of abdomen; moderately broad; faintly infuscate; venation yellowish; marginal vein a little yet distinctly longer than the stigmal which is moderately short and oblique; the postmarginal fully twice as long as the marginal, basal and median veins hardly indicated. Scape

slender; pedicel two-and-a-half times as long as wide; first funicle joint a little narrower and distinctly (about a third) longer, the second a little shorter than the pedicel, two-thirds as long as the first, and over twice as long as wide, the fourth a little longer than wide; club compact, 6-jointed, the first joint nearly as long as wide, 2-5 distinctly wider than long. Length, 3·20 mm.

Hab.—Queensland: Cairns district, 600-1,500 feet. Two females, jungle, July, 1915 (A. P. Dodd).

Type.—I. 5423, South Australian Museum. A female on a tag, antennae and forewings on a slide.

Opisthacantha flavescens, n. sp.

♀. Bright orange-yellow, the abdomen and legs golden-yellow: eyes and ocelli black, also a narrow longitudinal stripe along extreme laterad of second abdominal segment; antennae yellow, the club brown. Head moderately broad, no wider than the thorax; vertex rather broad, the occiput plainly concave; eyes moderately large, densely pubescent; ocelli rather small, wide apart, the lateral pair touching the eye margins. Head, scutum, and scutellum with fine surface sculpture and pubescence. Thorax stout, only slightly longer than wide; scutum large, the parapsidal furrows wide apart, delicate but complete; scutellum rather large; postscutellum with a short, stout acute tooth at meson; metanotum unarmed. Abdomen no longer than the head and thorax united, as wide as the thorax, hardly twice as long as greatest width, rounded posteriorly; segments all wider than long, the second and third longest, the latter nearly as long as the following united, the first without a horn or prominence; first and second striate, the rest smooth. Forewings attaining apex of abdomen; moderately broad; with two indistinct cross-bands, the first involving apex of submarginal and all marginal and stigmal veins, the second near wing apex, but the extreme apex obscurely hyaline; discal cilia fine, very dense; marginal vein nearly as long as the stigmal, which is moderately short and oblique, straight, the post-marginal thrice as long as the stigmal; basal and median veins hardly indicated. Antennae short; scape moderately long and slender; pedicel stout, one-third longer than wide; funicle joints as wide as the pedicel, the first as long as the pedicel, the second quadrate, the third and fourth transverse; club compact, 6-jointed, joints 1-5 very transverse, the third slightly the widest. Length, 1·15 mm.

Hab.—Queensland: Cairns district, 1,200 feet. One female, jungle, July, 1915 (A. P. Dodd).

Type.—I. 5424, South Australian Museum. A female on a tag, antennae and forewings on a slide.

BARYCONUS GRACILIS, n. sp.

♀. Head and thorax orange-yellow, the eyes and ocelli black; abdomen golden-yellow, the horn on basal segment, a patch laterad on both second and third segments posteriorly, and a band across fifth segment dusky-black; legs golden-yellow, the posterior trochanters, femora more or less, and apical two-thirds of tibiae, also apical half of intermediate tibiae dusky-brown; first seven antennal joints golden-yellow, the apical five black. Head normal, the occiput not concave; smooth and shining, with striae converging around the mouth, the vertex showing in patches faint impressed polygonal scaly sculpture; lower face not depressed; eyes not very large, bare; lateral ocelli a little separated from the eye margins. Thorax nearly twice as long as greatest width: pronotum a little visible from above; scutum narrowed anteriorly, about as long as greatest width, the parapsidal furrows distinct and complete and approaching close together posteriorly; median lobe at anterior half with fine impressed polygonal scaly sculpture, the scutum otherwise smooth: scutellum smooth, rather short, with a very fine foveate line along anterior and posterior margins; metanotum unarmed. Abdomen one-half longer than the head and thorax united; slender; first segment somewhat longer than wide, with a distinct horn projecting over the metanotum; second segment over twice as long as the first and somewhat longer than its greatest width, the third a little shorter than the second, the fourth not much shorter than the third, the fifth hardly one-half as long as the fourth, the sixth subconiform and a little longer than the fifth; first and second longitudinally striate, the third and fourth longitudinally reticulate-striate, the fifth and sixth smooth. Forewings not quite attaining apex of abdomen; narrow, the apex rounded; with two fuscous transverse bands, the first covering apex of submarginal and all marginal veins and as long as wide, followed by a hyaline band which is plainly shorter than it, the second fuscous band distinctly longer than the first, the wing apex narrowly subhyaline; marginal cilia moderately long; discal cilia moderately fine and dense; submarginal vein attaining the costa at slightly before one-half wing length; marginal vein about as long as the stigmal, which is rather short, straight, oblique; postmarginal vein fully thrice as long as the stigmal; basal and median veins not indicated; venation pallid-yellow, in the infuscate bands fuscous. Antennae 12-jointed; scape slender; pedicel fully twice as long as wide;

first funicle joint as long and as wide as the pedicel, the second as long as the first, the third distinctly shorter, the fourth quadrate; club compact, 6-jointed, joints 1-5 transverse, the first somewhat smaller than 2-5, which are about equal in length. Length, 1·75 mm.

Hab.—Queensland: Cairns district, 1,200 feet. One female, jungle, July, 1915 (A. P. Dodd).

Type.—I. 5425, South Australian Museum. A female on a tag, antennae and forewings on a slide.

Resembling *maculatus*, with which it agrees colourationally, but of a more slender build, the abdominal segments longer, and the third segment plainly not as long as 4-6 combined.

BARYCONUS AUSTRALICUS, Dodd.

Leptoteleia australica, Dodd: *ante*, 1913, p. 145.

BARYCONUS IMPERFECTUS, n. sp.

♀. Black; abdomen dark-dull-brown; coxae black, femora and tibiae fuscous, trochanters, knees, and tarsi pale-yellow; antennae black, the funicle fuscous. Head no wider than the thorax; vertex moderately broad; frons broad, without impressions; with fine polygonal scaly sculpture; eyes large, bare; ocelli small, rather wide apart, the lateral ones touching the eye margins. Thorax with fine polygonal scaly sculpture; one-half longer than wide; scutum large, slightly wider than long; parapsidal furrows delicate, failing anteriorly; post-scutellum and metanotum unarmed. Abdomen a little longer than head and thorax united, a little wider than thorax; third segment the longest, occupying one-third of surface, somewhat wider than long, as long as first and second combined, and as long as the following united; first segment without a horn or tubercle, much wider than long; first and second striate, the third feebly so, the remainder with fine surface scaly sculpture. Forewings hardly attaining apex of abdomen; moderately broad, the apex rather broadly rounded; faintly infuscate; discal cilia dense, very fine; submarginal vein attaining costa at fully one-half wing length; marginal vein one-third as long as the long stigmal, which is oblique, slightly convexly curved; postmarginal over twice as long as the stigmal; median and basal veins indicated by obscure brown lines. Scape moderately stout; pedicel twice as long as wide, the funicle joints a little narrower, the first nearly twice as long as wide, second a little longer than wide, third and fourth wider than long; club compact, 6-jointed, first joint small, 2-5 of nearly equal length, 1-5 much wider than long. Length, 1·45 mm.

Hab.—Queensland: Cairns district, 1,800 feet. One female, July, 1915 (A. P. Dodd).

Type.—I. 5426, South Australian Museum. A female on a tag, antennae and forewings on a slide.

Austroscelio latus, n. sp.

♀. Black; the coxae concolorous, the femora fuscous except at apex, the trochanters, tibiae, and tarsi golden-yellow; antennae wholly black. Head large, very transverse, distinctly wider than the thorax; from in front distinctly wider than long; with rather shallow open raised reticulation, the lower half or more of face rather shallowly depressed and transversely striate; eyes large, pubescent; ocelli rather small, very wide apart, the lateral pair touching the eye margins. Thorax about as wide as long; scutum and scutellum rather finely longitudinally rugulose; scutellum semicircular, rounded posteriorly; postscutellum transverse, unarmed, rather prominent, projecting over the very short metanotum. Abdomen broadly sessile, as wide as long; second segment occupying fully one-half of surface; broadly rounded posteriorly and almost truncate; first segment longitudinally rugulose, the second polygonally reticulate, raised, dense mesally, open laterally, the remaining segments with shallow open reticulation. Forewings attaining apex of abdomen; broad, the apex broadly rounded; subhyaline; discal cilia dense, rather fine; venation fuscous; marginal vein short, one-half as long as the stigmal, which is short, straight, and rather oblique, the post-marginal wanting. Antennae short; scape rather long and slender; pedicel two-thirds longer than wide, the funicle joints somewhat narrower, the first a little longer than wide, 2-4 wider than long; club compact, 6-jointed, joints 1-5 much wider than long, the first small, the second the longest. Length, 1·10 mm.

Hab.—Queensland: Cairns district, 1,800 feet. One female, forest, July, 1915 (A. P. Dodd).

Type.—I. 5427, South Australian Museum. A female on a tag, the antennae and forewings on a slide.

Differing from the generic diagnosis in having the antennal depression not very profound, the scutellum semicircular and rounded posteriorly, and the shorter, broad abdomen.

Xenomerus laticeps, n. sp.

♀. Black; legs golden-yellow, the coxae reddish; antennae wholly black. Head very transverse, somewhat wider than thorax; vertex very thin; viewed from in front distinctly wider than long; eyes moderately large, bare;

vertex and frons smooth and shining, the occiput with fine polygonal scaly sculpture; a carina runs from front ocellus to antennal prominence. Thorax as wide as long; scutum with distinct polygonal scaly sculpture, vanishing against posterior margin; parapsidal furrows as deep abbreviated grooves, rather less than one-half complete from posterior margin; scutellum smooth, shining, with a foveate row along anterior and posterior margins; postscutellum with a rather long acute spine or tooth; metanotum extremely short, unarmed. Abdomen broadly oval, scarcely longer than greatest width; first segment strongly transverse, the second as long as first, the third plainly longer than first and second combined, and fully twice as long as the following united; first and second strongly striate, the third with fine impressed striae mesally, smooth laterally and posteriorly, the remaining segments with fine scaly sculpture. Legs slender. Forewings attaining beyond apex of abdomen; moderately broad, the apex rather broadly rounded; hyaline; discal cilia rather coarse, moderately dense; venation terminating slightly before one-half length, thick and distinct, yellow-brown; stigmal vein moderately long for the subfamily. Scape normal; pedicel two-and-a-half times as long as wide; the funicle joints somewhat narrower, the first two-and-a-half times as long as wide, the second distinctly shorter, one-half longer than wide, third as wide as long, fourth wider than long; club 6-jointed, rather compact, joints 1-5 distinctly wider than long, second a little the largest. Length, 1·25 mm.

Hab.—New South Wales: Brooklyn. One female, labelled "Sweeping in forest, partly boggy, October 31, 1914, A. A. Girault."

Type.—I. 5428, South Australian Museum. A female on a tag, antennae and forewings on a slide.

Both *dubius*, Dodd, and *flavicornis*, Dodd, have the second funicle joint as long as the first, also the antennae are partly yellow; *varipes*, Dodd, has no well-defined spine on the postscutellum.

TRIMORUS NITESCENS, n. sp.

♀. Black; coxae fuscous, the legs yellow suffused with dusky; antennae black, the scape yellow at extreme base. Head transverse; smooth and shining, the lower face above and around mouth with converging striae; a faint line runs from front ocellus to near antennal insertion; eyes large, very feebly pubescent. Scutum much wider than long, smooth, shining, with a few scattered setae; parapsidal furrows consisting of a row of foveate punctures, widening posteriorly and forming irregular rugose shallow sulci; posterior margin of scutum with a row of punctures; scutellum

smooth, shining, with a fine foveate row along anterior and posterior margins; postscutellum with a stout acute spine: latero-posterior angles of metanotum with a small acute spine or tooth. Abdomen stout, distinctly less than twice as long as greatest width; first segment one-half as long as greatest width, the third rather longer than first and second combined, more than twice length of following united; first segment and most of the second striate, the rest smooth and shining. Legs slender. Scape slender; pedicel barely one-half longer than wide; first funicle joint fully as long and as wide as pedicel: the second a little shorter, a little longer than wide: third and fourth small, transverse; club 6-jointed, joints 1-5 transverse, the first smaller than others, 2-5 of about equal length, the third slightly the widest. Forewings attaining apex of abdomen; moderately broad, the apex moderately rounded: a little less than proximal half (to base of marginal vein) hyaline, the rest plainly infuscate; discal cilia dense, moderately fine; marginal cilia moderately long; submarginal vein attaining costa at almost one-half wing-length: marginal vein a little more than half length of submarginal, the stigmal very short; venation fuscous, distinct. Length, 1·50 mm.

Hab.—New South Wales: Brooklyn. One female, labelled "Sweeping grass, etc., November 18, 1914, A. A. Girault."

Type.—I. 5430, South Australian Museum. A female on a tag, antennae and forewings on a slide.

TRIMORUS AURATUS, n. sp.

♀. Head black; thorax bright orange-yellow, the scutellum dusky; base of abdomen bright-yellow, the rest dusky-black; legs golden-yellow; antennal scape yellow, dusky at apex, the antennae otherwise black. Head transverse, no wider than the thorax, the vertex thin, the frons a little convex: smooth and shining, toward mouth with converging striae: a very fine carina runs from antennal insertion to anterior ocellus; eyes moderately large, bare. Thorax a little longer than greatest width; parapsidal furrows complete but delicate; scutum with fine surface sculpture and pubescence; scutellum smooth, at its base with very fine pubescence; postscutellum with a short stout acute tooth; latero-posterior angles of the metanotum not acute. Abdomen stout, not much longer than its greatest width; first segment transverse, the third occupying fully one-half length, the first and second and base of third longitudinally foveate-striate. Forewings long; moderately broad; subhyaline; discal cilia fine and dense; venation light-fuscous; marginal vein almost as long as the submarginal, the stigmal short, with a distinct knob.

Scape slender; pedicel twice as long as greatest width; first funicle joint as long and as wide as pedicel, the second hardly shorter than the first, the third and fourth very short and wider than long; club 6-jointed, compact, joints 1-5 transverse, 2-5 of about equal length. Length, 1·10 mm.

Hab.—Queensland: Cairns district. One female, on window, February, 1916 (A. P. Dodd).

Type.—I. 5430, South Australian Museum. A female on a tag, antennae and forewings on a slide.

Very similar to *Hoplogryon pulchrithorax*, Dodd.

Gryonella crawfordi, Dodd.

Four males, labelled "Sweeping native flora in a park, Muswellbrook, New South Wales, October, 1914, A. A. Girault."

Phanuromyia necopinata, n. sp.

♀. Black; the antennae concolorous; legs concolorous, the trochanters, knees, tips of tibiae, and the tarsi rufous; valves of ovipositor yellow-brown. Head transverse, somewhat wider than the thorax; vertex very thin; occiput feebly concave; eyes moderately large, faintly pubescent; ocelli very wide apart, the lateral ones touching the eye margins; head, viewed from in front, distinctly wider than long; mandibles with three small teeth; vertex with fine polygonal scaly sculpture, this present also on either side of antennal insertion, the face otherwise smooth and shining. Thorax as wide as long; scutum with fine polygonal scaly sculpture and rather dense fine pubescence; scutellum smooth, except for scattered pubescence. Abdomen as wide as the thorax; two-thirds longer than greatest width; first segment extremely short; second somewhat longer than wide, nearly thrice as long as the following united; first segment and extreme base of second strongly longitudinally foveate-striate, rest of second segment smooth, the following with numerous pin-punctures; ovipositol valves exserted for a length equal to one-half that of abdomen. Forewings attaining distinctly beyond apex of abdomen; broad, the apex broadly rounded; hyaline; marginal cilia rather short; discal cilia rather fine, dense; venation fuscous; submarginal vein attaining costa somewhat before half wing-length; the marginal hardly one-third length of stigmal, which is very long, slender, moderately oblique; postmarginal one-half longer than stigmal. Scape slender; pedicel fully twice as long as greatest width; first funicle joint a little narrower, fully twice as long as wide; second a little longer than wide, the third quadrate, the fourth

wider than long; club 5-jointed, not compact, first joint small and transverse, 2-4 slightly wider than long, the second a little the largest. Length, 1·25 mm.

Hab.—New South Wales: Muswellbrook. Two females, labelled "Sweeping native flora in park, October 26, 1914, A. A. Girault."

Type.—I. 5431, South Australian Museum. A female on a tag, antennae and forewings on a slide.

Trissolcus flaviscapus, n. sp.

♀. Black; legs reddish-yellow, the coxae and anterior femora black; antennal scape yellow, the pedicel fuscous, the flagellum black. Head, dorsal aspect, transverse, somewhat wider than the thorax, the vertex thin, the occiput gently concave; viewed from in front, somewhat wider than long; vertex and front with coarse scaly sculpture, appearing shagreened; immediately above antennal insertion is a small shallow depression which is transversely striate, above which is a delicate groove running to front ocellus; eyes large, bare; ocelli wide apart, the lateral ones almost touching the eye margins. Thorax as wide as long; scutum and scutellum with similar sculpture to the head, the former with some very fine pubescence; parapsidal furrows deep, a fourth or more complete from posterior margin; postscutellum prominent, with several strong striae or carinae. Abdomen as wide as thorax; no longer than wide; first segment short, the second fully twice as wide as long and as long as the following united, the third one-half length of second; first segment and extreme base of second strongly foveate-striate, the second otherwise smooth, but on either side of meson with obscure, fine, close, impressed striae, which fail posteriorly; third smooth, laterally with minute pin-punctures; the rest with minute pin-punctures. Forewings long, broad, hyaline; submarginal vein attaining costa a little before one-half length, the marginal one-third as long as the stigmal, which is very long and slender; post-marginal one-half longer than the stigmal; venation yellow. Scape normal; pedicel fully twice as long as greatest width; funicle joints a little narrower, the first distinctly shorter than pedicel and barely twice as long as wide, the second quadrate, the third wider than long; club 6-jointed, first joint small, 2-5 distinctly wider than long, the second somewhat the largest. Length, 1·25 mm.

Hab.—Queensland: Pentland. One female, forest, September, 1914 (A. A. Girault).

Type.—I. 5432, South Australian Museum. A female on a tag, antennae and forewing on a slide.

PRODISCOTHYREA, A NEW GENUS OF PONERINE ANTS FROM QUEENSLAND.[1]

By WILLIAM MORTON WHEELER.

(Communicated by Arthur M. Lea.)

[Read April 13, 1916.]

PLATE IV.

PRODISCOTHYREA, gen. nov.

Worker. Small, monomorphic, closely related to *Discothyrea*, Roger. Mandibles triangular, with straight, toothless apical border, furnished with a row of short, dense, regular setae. Both the maxillary and labial palpi 4-jointed. Head produced and narrowed in front to the very short, transverse clypeus which projects out over the mandibles like a roof. Frontal carinae large, lyriform, horizontally flattened, apparently fused in front with the middle of the clypeus, where they are closely approximated. Frontal area and groove obsolete. Head deeply and broadly excavated at the sides of the frontal carinae, forming large, laterally indistinct scrobes for the accommodation of the antennal scapes. Ocelli absent, eyes small, but convex, well in front of the middle of the head. Antennae very large and robust, 10-jointed; scape incrassated, inserted at the anterior border of the head very near the clypeal margin, concave on the flexor surface for the accommodation of the funiculus; the latter with greatly enlarged apical and very transverse basal joints. Thorax short, convex and rounded above, without promesonotal and mesoëpinotal sutures, epinotum merely tuberculate, inferior corners of pronotum blunt. Petiole small, rounded above, and attached by nearly its whole posterior surface to the postpetiole, unarmed beneath. Postpetiole very large, forming the great bulk of the abdomen; gastric segments small, the first very convex above, turned downward and forward, remaining segments small, forming an anteriorly directed cone, as in *Discothyrea*, *Proceratium*, *Sysphincta*, and *Spaniopone*. Sting well developed. Legs with slender

(1) "Contribution from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 102.

tarsi and simple claws; middle tibiae without spurs, hind tibiae with a single large feebly-pectinated spur. Body opaque, sculptured; hairs absent; pubescence short, dense, and silky.

Female (deälated). Very similar to the worker and but slightly larger. Ocelli present, but small; eyes somewhat larger than in the worker. Thorax with distinct pronotal, mesonotal, scutellar, metanotal, and tegular sclerites, and with stumps of the lost wings.

PRODISCOTHYREA VELUTINA, sp. nov.

Worker. Length, about 2 mm.

Head subrectangular, a little longer than broad. decidely narrower in front than behind, very convex above, with straight posterior and rather convex lateral borders and rounded posterior corners. Gular surface rather convex, with a prominent, ridge-shaped tubercle on each side. Clypeus transversely and regularly convex, its anterior border straight and distinctly crenulate, especially in the middle. Frontal carinae extending back about two-thirds the length of the head, dilated and horizontally flattened in the middle, the space between them scarcely concave, rounded anteroposteriorly and continuous with the regular convex surface of the head. Antennal scapes nearly two-thirds as long as the head; scapes incrassated, especially at the apex, where they are nearly one-fourth as broad as their length; first funicular joint rather broad, subglobular, distinctly broader than long; joints 2-5 subequal, very transverse; 6-8 larger and proportionately longer, terminal joint very large, glandiform, as long as the remainder of the funiculus, about two and one-half times as long as broad. Thorax narrower than the head, seen from above trapezoidal, about one and two-fifths as long as broad, and one and one-half times as broad through the humeri as through the epinotum, sides slightly concave; humeri bluntly angular; in profile the thoracic dorsum is very unevenly convex to the declivity of the epinotum, which is abrupt, concave, and marginate on the sides. Each margination merges into a scarcely distinguishable tubercle above, and the base and declivity are separated by a transverse ridge. Petiole from above nearly twice as broad as long, broader behind than in front, with straight anterior and lateral and feebly convex posterior borders; in profile the segment is less than twice as long as high, convex and anteriorly sloping above and on the sides, its ventral surface compressed and translucent anteriorly, but without a spine

or tooth. Postpetiole convex above, one and one-quarter times as long as broad, much broader behind than in front, where it is as broad as the posterior border of the petiole, the ventral surface anteriorly with a blunt, transverse tubercle. First gastric segment separated by a slight constriction from the postpetiole, as broad as long, very convex dorsally, and rapidly narrowed behind to the small remaining segments. Legs moderately long, tarsi slender. Opaque; gaster and legs somewhat shining. Mandibles densely and finely punctate-rugulose. Head, thorax, petiole, and postpetiole uniformly and densely foveolate (thimble-pitted), gaster and legs very finely and densely punctate and shagreened; antennal scapes with smaller and more scattered foveolae than the head. Hairs lacking; whole body covered with short, fine, dense, silky, yellowish-white pubescence, so that the surface appears like velvet under a low magnification. Rich ferruginous-red; gaster and legs, including the coxae, slightly paler and more yellowish; edges of frontal carinae, posterior border and a median dorsal line on the postpetiole, and a similar line on the first gastric segment deep brownish-red.

Female (deälated). Length, about 2·4 mm.

Differing from the worker in the larger eyes, the presence of ocelli, and the structure of the thorax. Pronotum twice as broad as long and very short in the middle, owing to the extension forward of the mesonotum, which is as long as broad, evenly convex above, with distinct parapsidal furrows. Tubercles of the epinotum distinctly larger and more acute than in the worker.

Described from 39 specimens, one female and 38 workers, constituting an entire colony taken by myself October 24, 1914, in a small clearing in the tropical "scrub" (rain forest) at Kuranda, Northern Queensland. The nest was of peculiar structure, being a small, regularly-elliptical cavity, 2 cm. long by 1·5 cm. in width, in the soil under the centre of a large flat stone. This cavity was completely lined with the dense, white mycelium of a fungus, on which the ants were quietly resting. When disturbed their movements were very slow, and many of them curled up and "feigned death." I could find no larvae in the cavity, but there were several small, pinkish, spherical bodies, which I took to be parts of the fungus. The nature of the delicate layer of nutrient substratum on which the hyphae were growing could not be ascertained. The colour, sculpture, and velvety texture of the ants and their timid behaviour are strikingly like those of certain species of the neotropical fungus-growing tribe

Attiini (notably species of *Sericomyrmex* and *Apterostigma*).[2] These peculiarities, and the fact that the colony was completely shut off from the outside world by a layer of mycelium, strongly suggest that *Prodiscothyrea velutina* is a fungus-growing and fungus-eating ant. Should further research prove this supposition to be correct, the insect would be of considerable interest as the first case of a fungus-gardener among the ants of the Old World, and the first to exhibit the habit among the members of the subfamily Ponerinae. As the Ponerinae are by common consent regarded as a very ancient and primitive group, we should have to infer that the habit was probably of great antiquity, and had been acquired independently at least twice during the phylogeny of the Formicidae. The possibility of a third independent development of the habit is, indeed, suggested by the extraordinary Myrmicine ant *Proatta butteli*, recently described by Forel from Sumatra, because it is structurally very similar to certain species of the Attiine genus *Mycocepurus*, but von Buttal-Reepen did not find it associated with fungi, but in the carton nest of a termite (*Hamitermes dentatus*, Harv.), which does not cultivate fungi like many of the Old World termites.

Prodiscothyrea evidently belongs to Emery's tribe Proceratiini, and is very closely related to *Discothyrea*. In this genus, however, the antennae are 9-jointed, the clypeus forms a semicircular disc instead of a very short, transverse plate, the frontal carinae are very much smaller and shorter, there are no large impressions on each side of the head for the accommodation of the antennal scapes, the eyes are smaller and at the middle of the sides of the head, and in the female the eyes and ocelli, judging from the descriptions, are much larger. Like *Discothyrea* and *Spaniopone*, *Prodiscothyrea* is related to *Bradoponera* of the Baltic amber, which is of the lower Oligocene age. The Australian genus is evidently an ancient Mesozoic genus, like Paranomopone, which I recently described, from the same locality in Northern Queensland (Psyche, xxii., 1915, pp. 117-120, pl. 1). The great antiquity of the tribe Proceratiini is attested by its wide geographical range and the sporadic occurrence of species of *Proceratium*, *Discothyrea*, and *Sysphincta* in widely separated regions of both hemispheres.

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[2] The peculiar structure of the toothless mandibles, with the dense, regular row of short setae along their apical borders, is also suggestive of habits which require the manipulation of such delicate bodies as fungus hyphae, though I know of no similar structures in our American fungus-growing ants.

EXPLANATION OF THE PLATE.

Fig. 1. Worker of *Prodiscothyrea velutina*, sp. nov., from the side.
,, 2. Head of same from above.
,, 3. Head from below.
,, 4. Head from behind.
,, 5. Mandible from below.
,, 6. Extensor surface of antenna.
,, 7. Dorsal view of thorax, petiole, and postpetiole.
,, 8. Middle leg.
,, 9. Hind leg.

AMENDING NOTE.

Professor Wheeler writes that it is necessary to make some amendments to his paper dealing with the ants, taken by Captain White, in last year's Transactions; as "I find that the name *Polyrhachis longipes* [3] is preoccupied, and I would substitute for it *Polyrhachis macropus*. The name *Camponotus aurofasciatus* [4] was given by mistake to the minor worker of *Camponotus (Myrmotrema) inflatus*, Lubbock, as I find from examination of some of the material you sent me for study. The minor worker of this ant had not been described, and is so different from the major worker of *inflatus* that I did not recognize it as belonging to that species."

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[3] *Ante*, 1915, p. 821.
[4] *L.c.*, p. 817.

On the Occurrence of Arenicola loveni, Kinberg, on the Coast of South Australia.

By J. H. Ashworth, D.Sc., Lecturer in Invertebrate Zoology in the University of Edinburgh.

(Communicated by Edgar R. Waite, F.L.S.)

[Read May 11, 1916.]

By the courtesy of Mr. Edgar R. Waite I was afforded facilities during the early part of August, 1914, for examining the annelids in the collection of the South Australian Museum, Adelaide. Among the unnamed material were two bottles containing specimens of *Arenicola* from the coast of South Australia, and these have recently been sent to me for examination. The specimens prove to belong to the species *A. loveni*, Kinberg, hitherto recorded only from three localities on the coast of South Africa, and a short account of their chief features is given.

Arenicola loveni, Kinberg, *emend.* Ashworth.

Kinberg, J. G. H.: Ofvers. Köngl. Vet.-Akad. Förhandl., 1866 (1867), p. 355; Eugenies Resa, Zool., vii., Annulata (1910), p. 73; taf. xxix., fig. 1.

Ashworth, J. H.: Arkiv. för Zool., vii. (1910), No. 5, 1 pl.; Annals S. African Mus., xi. (1911), p. 1, pl. i.; Cat. *Chaetopoda*, Brit. Mus., i., *Arenicolidae* (1912), p. 103, pls. iii. and iv., fig. 11.

The characters of the species are:—Caudate *Arenicola* with nineteen chaetiferous segments; thirteen pairs of gills, the first gill on the seventh segment, gills large and pinnate; the median lobe of the prostomium is large, the smaller lateral lobes are of almost uniform width, that is, they are not dilated or lobate at their anterior ends; neuropodia are clearly visible in each segment, those of the branchial and of the two prebranchial segments are long dorso-ventrally and almost reach the mid-ventral line; five pairs of nephridia, which open on the fifth to the ninth segments; one pair of oesophageal glands; two very large septal pouches, which pass through apertures in the second septum and terminate immediately in front of the third septum; a pair of closed statocysts, each containing a single large secreted statolith.[1]

[1] A description of these anatomical features is given in the writer's publications cited above.

Two specimens are from the Bay of Shoals, on the north-east coast of Kangaroo Island, and two are from Kingston, Lacepede Bay (long. 139° 80′ E., lat. 36° 80′ S.). Their dimensions are:—

(1) Total length 320 mm., the tail being 110 mm.
(2) ,, ,, 220 ,, ,, ,, 78 ,,
(3) ,, ,, 275 ,, ,, ,, 100 ,,
(4) ,, ,, 190 ,, ,, ,, 40 ,, (incomplete).

They are stout worms, the maximum girth of the largest specimen being 56 mm. Their colour is brown (in alcohol), the tail being paler than the rest of the worm, and in two cases almost greyish in tone.

In each worm the first gill is borne on the seventh segment, and the gills are pinnate. The third gill of specimen (3) has seventeen main axes, each of which bears, right and left, branches terminating in gill-filaments.

The outlines of the prostomium are imperfectly preserved in all the specimens.

The neuropodia are of the usual elongate type, and their chaetae (crotchets) are similar in general form to those of South African examples, but have a sharper rostrum and distinct postrostral teeth are present.

The notopodial chaetae differ from those of South African specimens, as they do not present the well-marked transverse striation so characteristic of the latter. They are provided with numerous pointed processes,[2] less regularly arranged than in the South African examples, and almost like those of *A. cristata* (compare fig. 12, p. 45, in Cat. Chaet., Brit. Mus.). Specimens of *A. loveni* from different localities evidently exhibit some variation in regard to the processes of their notopodial chaetae. The transverse striation of these chaetae, given in my previous accounts of *A. loveni* as a specific character, proves to be a variable feature, and has therefore been omitted from the statement of the diagnostic characters of the species given above.

Two of the specimens, one from each locality, have been dissected. Both possess five pairs of nephridia and a single pair of conical oesophageal glands.

The septal pouches, the most striking internal feature of this species, are of the usual large size, and extend backwards, through apertures in the second septum, until they almost reach the third septum. In the largest specimen (1) the longer of the two septal pouches attains a length of 23 mm.

[2] These are much obscured by a covering of *débris*.

One of the statocysts of specimen (3) was excised, stained, and mounted. It is a closed vesicle with thick walls and contains a large roundish secreted statolith, the diameters of one face of which are about ·114 mm. and ·105 mm. respectively.

These features clearly show that the South Australian specimens belong to the species *A. loveni*, and agree with those from South Africa, with the exception of certain differences in their chaetae (see above).

The only other feature which calls for notice here is the presence, in both the specimens dissected, of a pair of thin-walled globular dilatations, each about 4 mm. in diameter, on the dorsal blood-vessel immediately anterior to the paired hearts and posterior to the oesophageal glands. Similar dilatations are not present in the three South African examples of *A. loveni* in my collection.

Arenicola loveni has hitherto been found only on the coast of South Africa. The type specimen, preserved in the Riks Museum, Stockholm, was found at Port Natal, near Durban, some fifty years ago; but until it was examined by the writer its characters were so imperfectly known that it was impossible to state if *A. loveni* was a valid species. From the type and from further specimens, collected in Saldanha Bay and False Bay, were prepared a full description and diagnosis of the species (Ashworth, 1910-11). The present records from the South Australian coast greatly increase the known range of distribution of the species, and it would be interesting to ascertain how far the species extends, east and west, along the Australian coast.

In this connection it may be remarked that the records of *Arenicola* from the Australian coast are very scanty;[3] there are, indeed, only two previous records. Some years ago

[3] The writer, during his recent visit to Australia, examined many long stretches of sandy shore, but without finding castings or specimens of *Arenicola*. The absence of *Arenicola* and its castings forms one of the most striking differences between the Australian beaches and those of Britain and Western Europe, for *Arenicola marina* is so abundant and readily accessible in Western Europe that it is commonly used as bait. This species occurs in greatest numbers in those beaches where the sand is not shifting and contains a considerable proportion of the decomposing organic matter on which these worms feed. *Arenicola* is scarce or absent in stretches of clean sand, *i.e.*, where food is scanty, and also where the force of the sea is great and the sand is constantly shifting. The absence of *Arenicola* in many Australian beaches is due probably to the wonderful cleanness of the sand, and in other cases to the great force of the sea. The principal *Polychaeta* of the sandy beaches of Australia seem to be Eunicids, Nereids, and Ariciids, but especially the first-named, which are frequently collected for use as bait.

Professor Haswell kindly sent to me, from Burnie, Tasmania, a few small specimens of *Arenicola* which belong to the species *A. assimilis*, Ehlers, var. *affinis*, Ashworth, and about the same time I received from the Naturhistorisches Museum, Hamburg, a single specimen from Barrow Island, off North-west Australia, which proved to be *A. cristata*, Stimpson.

Arenicola assimilis and its variety *affinis* are widely distributed in southern regions. *A. assimilis* has been recorded from the Strait of Magellan, the Beagle Channel, and South Georgia, and the variety *affinis* from the first two localities, from the Falkland Islands, Kerguelen, Tasmania, New Zealand (Otago Harbour), and the islands to the south (Stewart, Campbell, Auckland, and Macquarie Islands), Plimmerton, near Wellington, N.Z., and from Table Bay and Angra Pequena (Lüderitzbucht), South Africa. These records show that *A. assimilis* is a characteristically southern species, and they present striking evidence for consideration in relation to the former greater extent of the Antarctic Continent and its influence on the present distribution of animals. The records indicate that this species may be expected to occur on the south-east coast of Australia, and a careful look-out should be kept for specimens which will probably seldom exceed 6 inches in length.

Arenicola cristata is evidently widely distributed in the warmer parts of the Indo-Pacific Ocean, although it has been found only at a few stations. The writer has recorded specimens from Suez, Japan, the Californian coast, and, as already mentioned, Barrow Island. Specimens might be looked for in suitable localities on the north coast of Australia.

The writer would be glad to examine and report upon specimens of *Arenicola* from any Australian locality, or indeed from any source.

Zoological Department, University of Edinburgh,
February 18, 1916.

A New Species of Leech from South Australia.

By W. Harold Leigh-Sharpe, B.Sc. (Lond.).
(Communicated by Edgar R. Waite, F.L.S.)

[Read May 11, 1916.]

Branchellion australis, n. sp.

Introduction.—By the courtesy of Dr. J. H. Ashworth, of the University of Edinburgh, I have examined six specimens of the genus *Branchellion* forming part of the collection of the Museum of South Australia, Adelaide. The tube containing the specimens bears the label "E129," and attached is a note to the effect that they were collected by W. B. Poole on March 27, 1912, at Port Victor, South Australia, attached to a Skate (*Raia lemprieri*, Richardson).

All the specimens are alike, but they exhibit somewhat marked differences from *Branchellion torpedinis*, Savigny, the only established species (*vide* Blanchard, 1894a). These differences are, in my estimation, of specific and not generic value only, and for the Australian leeches I propose the name *Branchellion australis*.

Body.—The largest specimen measures 35 mm., inclusive of the suckers, and 30 mm. without the suckers. The large specimen of *B. torpedinis* in the British Museum (Natural History), South Kensington, London, which I have used for purposes of comparison in this paper, measures 55 mm., of which the anterior sucker occupies a little more than 4 mm., the neck 7 mm., the abdomen 49 mm., and the posterior sucker a little less than 5 mm. The two largest specimens are greyish-black in colour and appear to be mature. The smaller specimens are white, having been decolourized by the alcohol in which they have been preserved. The leech is cylindrical, and divided the most sharply of all the Ichthyobdellidae into two distinct regions—a neck region, which is bare, and a spindle-shaped abdomen, the latter carrying laterally 31 pairs of foliaceous branchiae, and 11 pairs of rounded, pulsating, respiratory vesicles, described below. As in *B. torpedinis*, the neck is capable in the mature individuals (Apáthy, 1888) of being invaginated into the abdomen, the first segment of which, composed of two annuli, at least, forms a prepuce-like fold surrounding and overlapping the posterior portion of the clitellum. The leeches are considerably flattened in the abdominal region, being elliptical in section.

Suckers.—There is a sucker at each end of the body, as in all leeches. The anterior sucker surrounds the mouth, and is hoodlike. It almost certainly represents 6 segments. There are no eyes apparent in any of the specimens. This is peculiar, since *B. torpedinis* bears six distinct eyes on what is considered to be the fifth segment of the anterior sucker. The posterior sucker is twice the size of the anterior, and is in diameter about equal to the width of the abdomen at its broadest part. Its concave surface is covered with small papillae.

Segmentation.—(A description of *B. torpedinis*, for comparison with the following, is given by Apáthy, 1888, by Blanchard, 1894b, and, in English, external characters only, by Harding, 1910.) For notation see text figs. 1 and 2:—

(α) *Neck.*

A. Head.
(*a*) Anterior sucker
(*b*) 3 small annuli present in most genera } **6** segments.

B. Preclitellum.
9 annuli, representing ... ... **3** segments.

C. Clitellum ... ... **3** segments.

Each of the 3 segments, which are of about equal size, is composed of 2 annuli. In the first and third segments the first annulus is larger than the second. In the second segment they are of equal size. The male genital aperture opens between the two annuli of the second segment, and has projecting tumid lips. The female genital aperture opens on the first annulus of the third segment. Both apertures are ventral. The clitellum is covered by the preputial fold as far anteriorly as the second annulus of the first segment.

(β) *Body or Abdomen.*

A. Testis region and caecum region taken together. **12** segments.

Each of the 12 segments is composed of 3 annuli, except the first, which acts as a prepuce and is only divided into two. The remaining 11 segments bear each a pair of respiratory vesicles, one on each side, bordering the first annulus of the segment. In *B. torpedinis* every annulus of these segments bears a pair of lateral foliaceous branchiae, making 33 pairs in all, but in *B. australis* there are but 31 pairs of gills, the first annulus of segment 2 of the abdomen, which bears

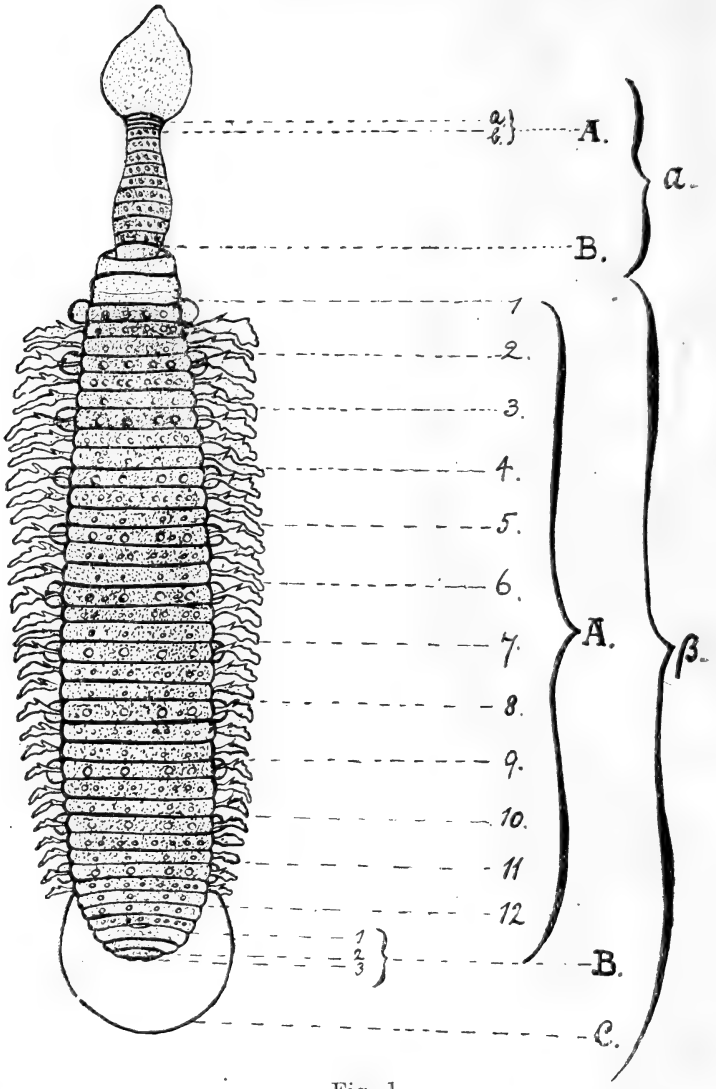

Fig. 1.

Branchellion australis.—The entire animal, viewed from the dorsal side; numbering and lettering explained in the text.

a large vesicle, does *not* bear gils, and the third annulus of the twelfth segment is without gills also. Thus the gills corresponding to the first and last pairs of gills present in *B. torpedinis* are absent in *B. australis*.

B. Anal region. **3** segments. The first two segments are composed of 2 annuli each, and the third of one annulus, making 5 annuli in all. The anus opens dorsally between segments 1 and 2—*i.e.*, between annuli 2 and 3.

C. Posterior sucker. **7** segments.

The total number of segments is therefore **34**.

Respiration. — Respiration is carried on by means both of the foliaceous branchiae and the rounded vesicles protruding from the abdominal portion of the body. Vesicles are common in other genera, and I have seen them rise and fall by pulsation in *Calliobdella lophii*. They receive lymph, which after aeration is returned to the lateral sinus, so that respiration is lymphatic. There are 31 pairs of gills, and 11 pairs of vesicles arranged as described above. The number of pairs of gills is a specific character. Blanchard (1894a) came to the conclusion that *B. torpedinis*,[1] which was originally described as having 35 pairs of gills, *B. orbiniensis* with 33 pairs of gills, and *B. rhombi* with 30 pairs of gills, were all one species, and that the founders of these species had miscounted the gills in every case, or had stated the

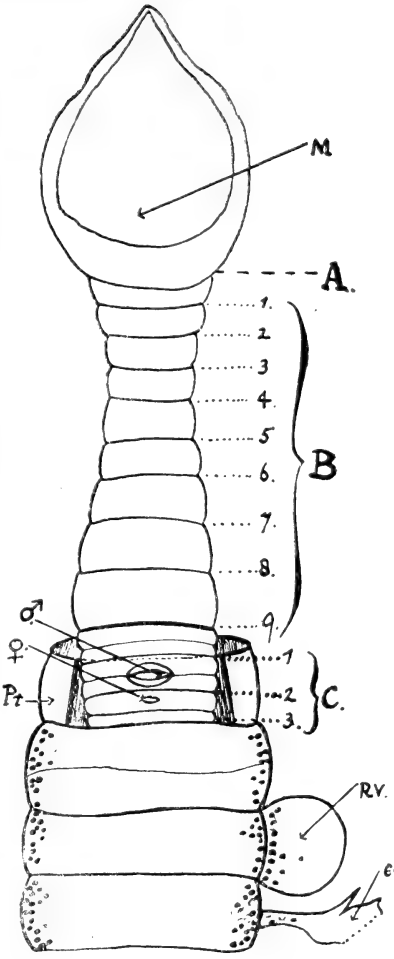

Fig. 2.

Branchellion australis.—The anterior end of the animal in ventral aspect, with the ventral portion of the prepuce removed to show the clitellum; numbering and lettering explained in the text. *M.*, mouth; ♂, male genital aperture; ♀, female genital aperture; *Pr.*, prepuce; *R.V.*, respiratory vesicle, the first on the left side without a gill; *G.*, the first gill on the left side.

[1] The name *B. torpedinis* was retained as having priority, although 33 pairs of gills was assumed to be the correct number.

total in round numbers only! He based this conclusion on the fact that some scores of leeches of all ages which he examined from various hosts and localities never showed any other number than 33 pairs of gills. The discovery of the present species with 31 pairs is, therefore, important and interesting, in that it shakes what appeared to be a reasonable certainty in Blanchard's conclusion, stated above. On the ventral surface along the boundary of each annulus runs a projecting flange which appears to unite the pair of branchiae of the annulus.

Pigment.—The whole of the dorsal surface is freely punctuated with black dots, easily visible under a lens: less freely is this pigment scattered on the gills and on the respiratory vesicles (text fig. 3). The ventral surface is

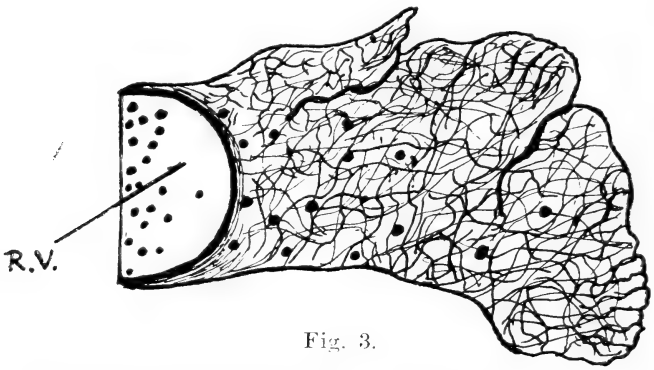

Fig. 3.

Branchellion australis.—Typical gill of preserved specimen. *R.V.*, respiratory vesicle with pigment spots.

unpigmented except towards the sides near the gills. There are on the dorsal surface, however, very conspicuous patches where the pigment is absent, giving to the unaided eye the appearance of whitish spots. The disposition of these white spots is very different from that in *B. torpedinis*, where there are six spots on the first annulus of each abdominal segment. In *B. australis* the spots are variable in number in different parts of the abdomen, being more numerous halfway along. A typical segment exhibits four large spots [2] on the first annulus, easily visible to the unaided eye, eight small spots on the second annulus, and four spots on the third annulus.

[2] And in the mid-abdominal region there are sometimes two smaller subsidiary spots.

The leeches are not all uniform in this respect, but the number of spots is always 4, 6, or 8, and the first annulus always has at least four large spots. In that part of the anterior sucker where one would expect to find eyes are large black spots, which I consider to be merely pigment-cells. There are eight or nine of these, at irregular distances apart: and some so nearly touch as to appear to the unaided eye to coalesce.

Body Wall.—The *epidermis* consists of a layer of cells elongated in a direction at right angles to the axis of the body, covered with a cuticle secreted at the free edge and having their nuclei away from their external border. Among the epidermal cells are epithelial glands for the secretion of mucus. The *derma* consists of a thick layer of connective tissue, which includes very small fibre-forming cells. Deep down in the derma are large flattened cells about 40 μ in length, and half as thick, situated immediately outside the muscle layer. They are far more numerous in the gills, whose structure resembles that of the body wall, as far as epidermis and derma are concerned (text figs. 4B and 5). The muscle layers run below the connective tissue layer, and immediately below them are found the cocoon-gland cells, which, however, do not attain the huge dimensions of those found in *Calliobdella*, *Abranchus*, and *Platybdella*, being only about 50 μ in their greatest diameter, a comparatively small size for such cells. Their appearance is precisely the same as I have described for *Platybdella* (1916). Below these cells run the cocoon-gland-cell ducts, interspersed with the longitudinal muscle fibres. There are no yellowish-brown pigment cells, such as are seen in *Calliobdella* (1914). The muscle is not striped, and the cells are about 1 mm. in length by 80-100 μ in breadth. Perez and Gendre (1904a) have drawn attention to some diagonal fibres in *B. torpedinis*, which are also present in *B. australis* in the same region, near the posterior sucker, and are intermediate between the ordinary muscle cells and the type well known in Nematodes. No pigment cells are shown in the figures, but it should be remembered that the leech sectioned had been decolourized by preservation in alcohol. Nevertheless, sections show pigment cells in the suckers.

Coelom.—The body cavity is divided into the five following regions:—A ventral sinus, a dorsal sinus, two lateral sinuses, and, in parts, an intestinal sinus. The dorsal blood-vessel is double, and is situated in the dorsal sinus, but comes outside it occasionally, and more frequently than in *Pontobdella*. In the more specialized genera—*e.g.*, *Calliobdella*—it remains within the sinus throughout its

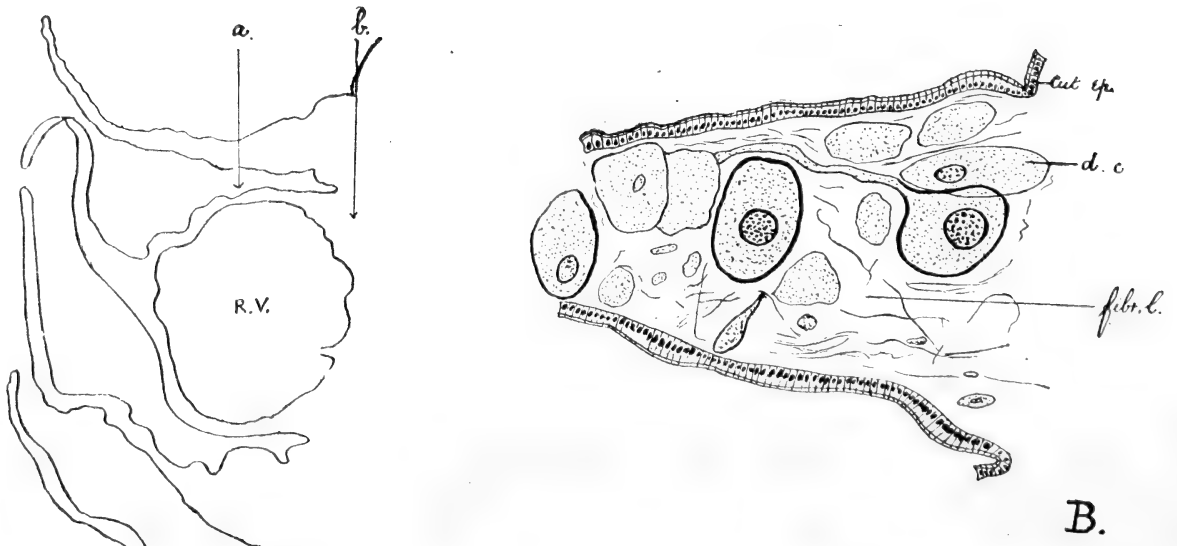

Fig. 4.

Branchellion australis.—*A.*, plan of four gills on the side of the abdomen as seen in a section under a low magnification; *R.V.*, respiratory vesicle; *B.*, a portion of a gill (the part between the lines *a.*—*b.* in the plan *A.*) under a high magnification to show the cellular structure; *Cut. ep.*, epidermis with cuticle; *d.c.*, dermal cells; *fibr. l.*, layer of fibrous cells.

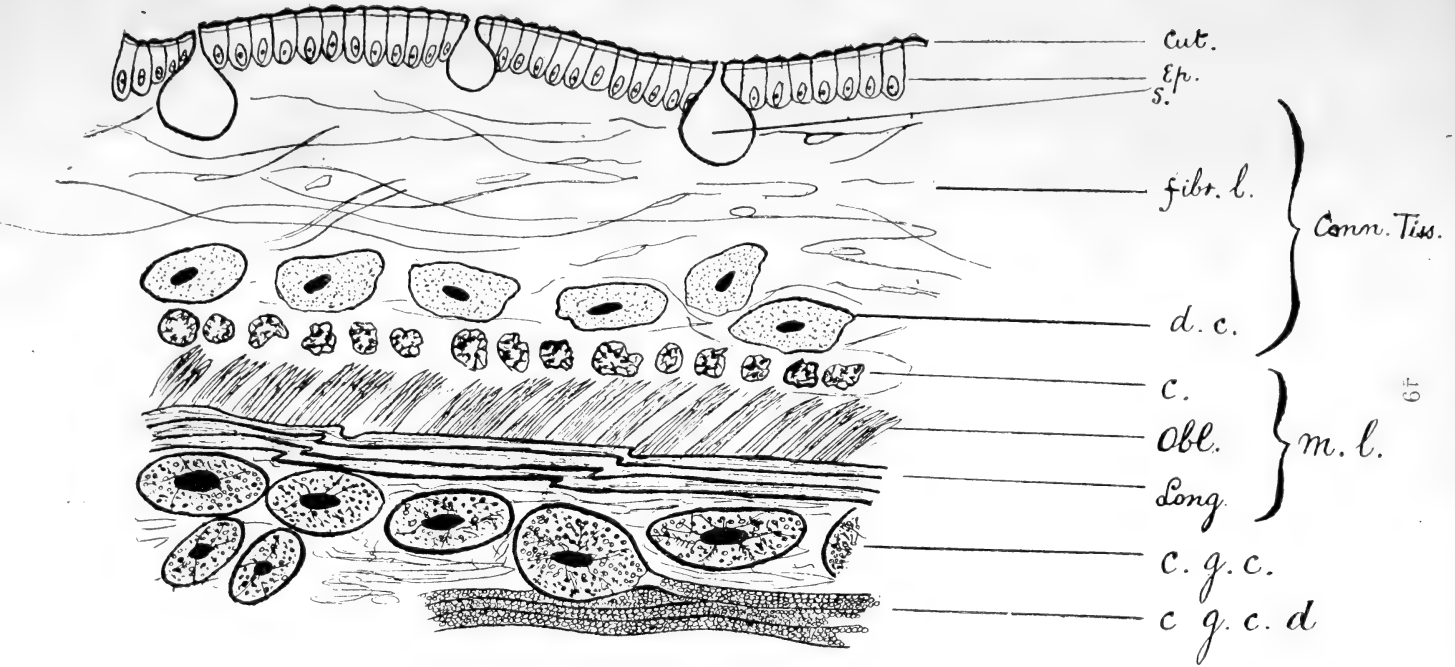

Fig. 5.

Branchellion australis.—Longitudinal section of the body-wall much magnified. *Cut.*, cuticle; *Ep.*, epidermis; *S.*, epithelial slime-gland; *Conn. Tiss.*, connective tissue; *fibr. l.*, fibrous cell layer; *d.c.*, large dermal cells of the same nature as those shown in Fig. 4 B.; *m.l.*, muscle layer (*c.*, circular; *Obl.*, oblique; *Long.*, longitudinal); *c.g.c.*, cocoon-gland cell; *c.g.c.d.*, cocoon-gland-cell duct.

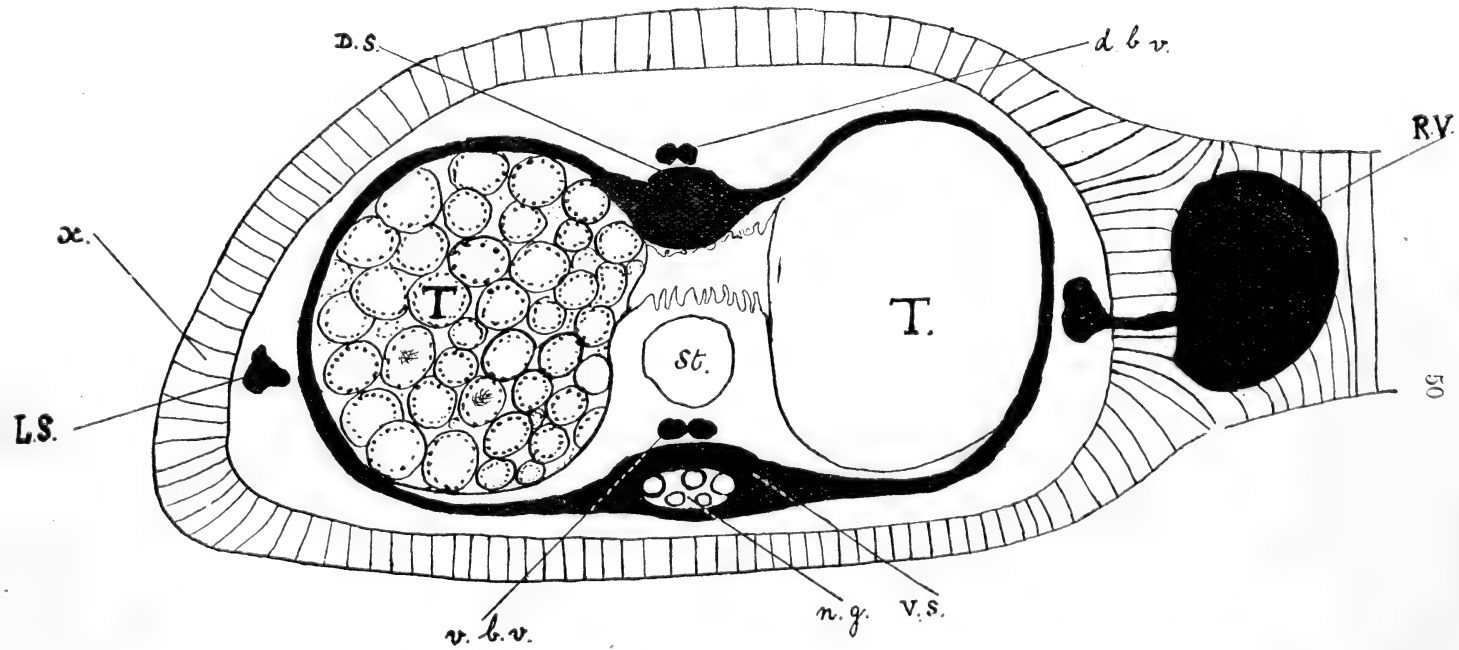

Fig. 6.

Branchellion australis.—Diagram of a transverse section of the body in the abdominal region. *x.*, the body-wall (the shaded part includes the layers shown on an enlarged scale in Fig. 5); *St.*, stomach; *T.*, testes; *D.S.*, dorsal sinus; *d.b.v.*, dorsal blood-vessel; *V.S.*, ventral sinus; *v.b.v.*, ventral blood-vessel; *L.S.*, lateral sinuses; *n.g.*, nerve-ganglion; *R.V.*, respiratory vesicle.

length. The ventral blood-vessel is also double for the greater part of its length outside the ventral sinus; again unlike *Calliobdella*. The lateral vessels give off branches which run into the branchiae and end with an open mouth. The lateral sinus, which runs parallel to the lateral vessels, communicates with the cavity of the respiratory vesicles (text fig. 6). The ovary is situated within the ventral sinus, as in *Pontobdella*.

The *Nervous System* and the *Alimentary Canal* resemble those of other Ichthyobdellid leeches, and do not present any special features. The various regions of the latter can be best seen from text fig. 7. The salivary glands are very well developed, and exhibit in section large secretory cells (text fig. 8). In the leech sectioned only the intestine contained a moderate quantity of nucleated red blood corpuscles taken as food from the host.

The *Reproductive System* bears a close similarity to that of other Ichthyobdellid leeches. The position of the genital apertures has already been mentioned. A general idea of the sexual organs may be gathered from text figs. 8 and 9. The *male* reproductive organs consist of six pairs of metameric testes, situated in the first six segments of the abdomen. The testes are chambered, and contain spermatozoa in all stages of development. From each testis springs a short vas efferens, that from the most posterior one serving as a source of the vas deferens of that side, and in its course received the remaining

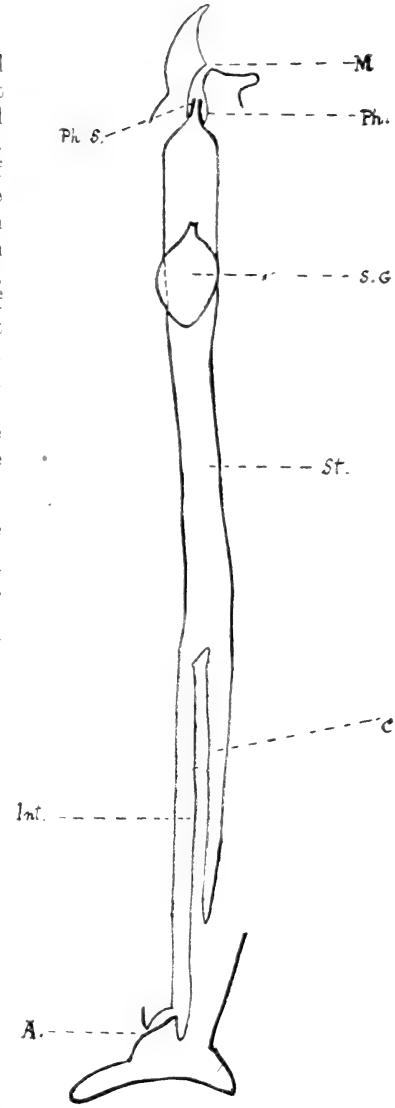

Fig. 7.

Branchellion australis. — Diagrammatic scheme of the alimentary canal in lateral aspect. *M.*, mouth; *Ph.*, pharynx; *Ph.S.*, pharyngeal sheath; *S.G.*, salivary glands; *St.*, stomach; *C.*, coeca; *Int.*, intestine; *A.*, anus.

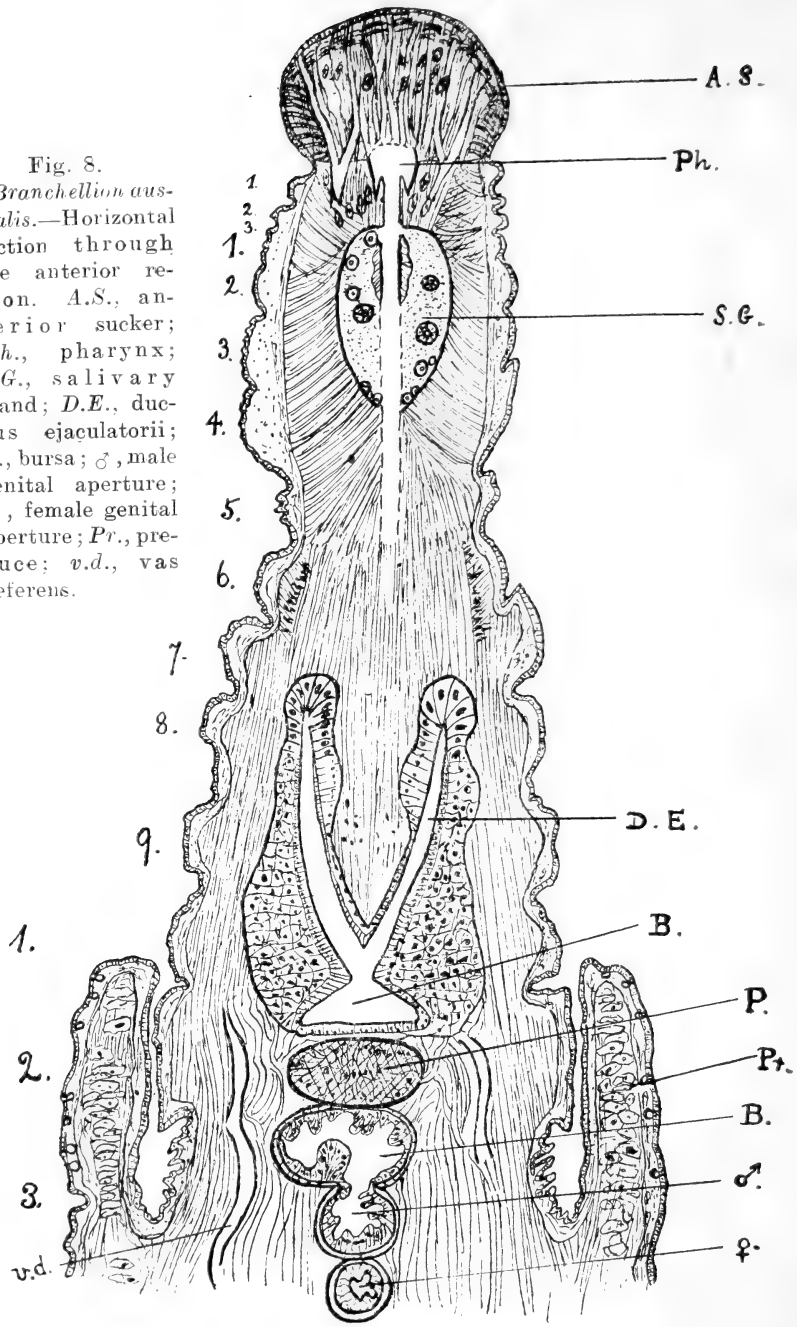

Fig. 8.
Branchellion australis.—Horizontal section through the anterior region. *A.S.*, anterior sucker; *Ph.*, pharynx; *S.G.*, salivary gland; *D.E.*, ductus ejaculatorii; *B.*, bursa; ♂, male genital aperture; ♀, female genital aperture; *Pr.*, prepuce; *v.d.*, vas deferens.

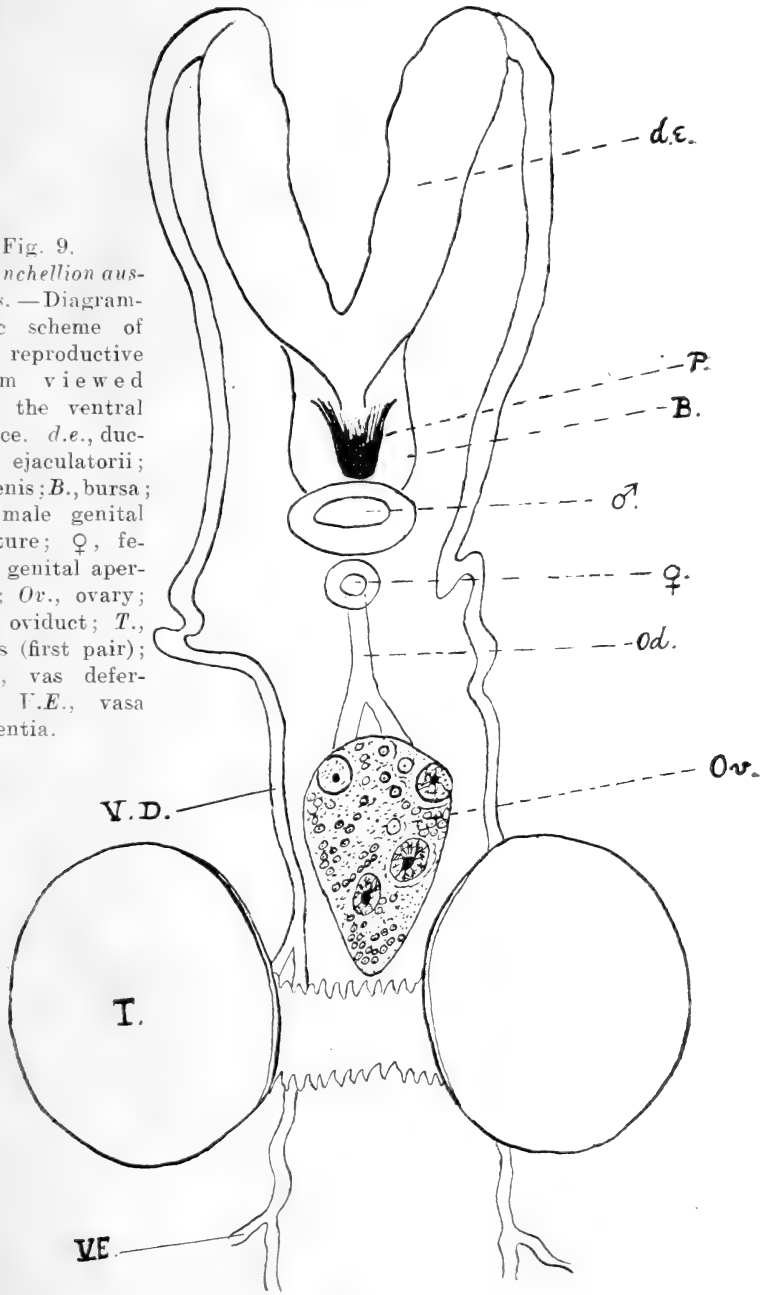

Fig. 9.
Branchellion australis. — Diagrammatic scheme of the reproductive system viewed from the ventral surface. *d.e.*, ductus ejaculatorii; *P.*, penis; *B.*, bursa; ♂, male genital aperture; ♀, female genital aperture; *Ov.*, ovary; *Od.*, oviduct; *T.*, testes (first pair); *V.D.*, vas deferens; *V.E.*, vasa efferentia.

vasa efferentia. In the posterior part of the clitellum each vas deferens curves slightly, and, from being ventral, turns dorsal, and runs forward to the anterior end of the eighth, or the posterior end of the seventh segment of the preclitellum: here each widens out to form the respective ductus ejaculatorii, which, from being dorsal, turn abruptly and run ventrally in a posterior direction. In the first segment of the clitellum the ductus ejaculatorii unite and enter the bursa by a common-end portion. The bursa, which has a fairly considerable saccular development, is, on its dorsal side, immediately posterior to the common opening of the ductus ejaculatorii, thickened to form a conical muscular penis, which functions as a copulatory organ. In none of the specimens is the penis extruded, and the common-end portion of the ductus ejaculatorii does not enter it, as far as I can discover. The *female* reproductive organs consist of a pair of pear-shaped vesicles situated in the first segment of the abdomen, their anterior portion being in advance of the first pair of testes, and their posterior and more pointed portion between the testes. Each vesicle contains in considerable numbers complex ovular bodies in all stages of development, over and above the germinal mass, in which two or three nuclei are enveloped by a mass of surrounding protoplasm. The eggs fall into the ovarian cavity, where they complete their development. The development of the ova has been carefully described by Perez and Gendre (1904b). The ovaries are of very large size, as compared with those of other leeches, such as *Calliobdella* and *Platybdella*, being in the one of the smaller specimens sectioned, very obvious, and half as large as a testis. A short oviduct leads from the vesicles to the female genital aperture.

Generic Characters.—Abdomen very distinctly marked off from the neck, the anterior portion covering the genital apertures on the clitellum as a preputial fold. Each abdominal somite (except perhaps the first) consists of three annuli. The abdomen is flattened and bears laterally foliaceous branchiae, not less than 30 pairs (the genera *Ozobranchus* and *Eubranchella* bearing quite a small number of pairs—*viz.*, 5 and 7 pairs respectively). Along the side of the abdomen are 11 pairs of pulsating respiratory vesicles, a pair to every segment except the first, a vesicle being at the base of the gill of the first annulus of each somite.

Specific Characters:—

B. AUSTRALIS, n. sp.	B. TORPEDINIS, Savigny.
(1) Branchiae, 31 pairs.	(1) Branchiae, 33 pairs.

(2) White spots on the dorsal side caused by the absence of black pigment are typically :— 4 large on the 1st annulus of each abdominal segment. 8 small on the 2nd annulus of each abdominal segment. 4 small on the 3rd annulus of each abdominal segment.	(2) White spots on the dorsal side caused by the absence of black pigment are typically :— 6 on the 1st annulus of each abdominal segment; none on the other annuli.
(3) Black pigment dots are absent from the major part of the ventral surface, so that there can be no white spots.	(3) White spots on the ventral surface: 4 on the 1st annulus of each abdominal segment.
(4) Eyes, apparently none.	(4) Eyes, 6.

In *B. australis* the neck region is relatively longer than in *B. torpedinis*, and the first segment of the abdomen larger. The gills are of a different shape from those of *B. torpedinis*, and, allowing for preservation, probably smaller, while the respiratory vesicles are relatively much larger. In the place where one expects to find eyes are larger black dots (in two of the specimens), which I regard as merely pigment cells: in any case, these are more than 6 (8 and 9 respectively).

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January, 1916.

Additions to the Flora of South Australia. No. 9.

By J. M. Black.

[Read May 11, 1916.]

Plates V. to VIII.

This list is largely the result of three excursions:—1. Up the Murray to Renmark by water, returning by the Paringa-Tailem Bend railway, October, 1915. 2. To Gladstone and Melrose, in the same month. 3. To Murat Bay, *viâ* the newly-opened railway from Port Lincoln, November, 1915. Specimens gathered on other occasions, and many forwarded by friendly collectors, have also been taken into account.

In dealing with the eucalypts I have had the great advantage of consulting Mr. J. H. Maiden, Government Botanist of New South Wales, and the leading authority on this difficult genus. Professor A. J. Ewart, Government Botanist of Victoria, has also lent me much kind assistance, especially in comparing doubtful specimens with those in the great herbarium under his control.

An asterisk denotes an alien plant more or less established in our State.

The contraction "Dist." placed between brackets and followed by a capital letter refers to the botanical districts in Tate's "Flora of Extra-tropical South Australia," and implies that the locality mentioned is a new record for the district.

Four new species are described and figured—in the genera *Triodia*, *Trichinium*, *Poranthera*, and *Brachycome*—and one new variety.

Coniferae.

Callitris robusta, R. Br. "Murray Pine." A large tree with spreading branches; Pinery, Melrose. *C. propinqua*, R. Br. Wudinna. Much the same tree in appearance; the cones comparatively small (20-23 mm. long), but with the thick valves and peduncles of the species. *C. verrucosa*, R. Br. A compact shrub under 2 m. high, with branches mostly erect, growing in mallee scrub at Karoonda; old fruits often less warted. Also Loxton, with very warted cones.

Gramineae.

**Bromus rubens*, L. Moolooloo (S. A. White); Edillillie; Minnipa. Specimens with the typical compact heads, turning

dark-purple when ripe. *B. arenarius*, Labill. The description in Fl. Aust., vii., 661, should read:—"Spikelets 15-30 mm. long, 5-14-flowered; the lowest glume 3-nerved, the second 5-7-nerved."

**Agrostis verticillata*, Vill. Creek near the brewery, Melrose. *A. quadriseta*, R. Br. Cummins (Dist. L.).

**Festuca Myuros*, L. Minnipa; Mooloolloo. **F. bromoides*, Smith. Minnipa; Pungonda.

**Trisetum pumilum*, Kunth. Mooloolloo.

**Lolium temulentum*, L. "Darnel." Cummins. **L. rigidum*, Gaud. Gladstone.

**Avena orientalis*, Schreb. The species of cultivated Oat, which seems to be usually sown in South Australia, is growing wild on the sandy soil of Thevenard Peninsula. **A. barbata*, Brot., the slender Wild Oat, seems to avoid cultivated land and is found in such places as the Adelaide Park Lands, roadsides, creeks, gullies, railway reserves, and generally in waste places, at least as far north as Melrose, whereas **A. fatua*, L., the common Wild Oat, is almost always found in cultivated soil.

**Koeleria phleoides*, Pers. With typical tuberculate flowering glumes; Tooligie; Melrose.

**Lamarckia aurea*, Moench. A Mediterranean grass common at Renmark and at Woolshed Flat, near Quorn (Miss J. Mills). Recorded by Mueller in 1864 as growing at Swan Hill, on the Murray, but not previously noted for South Australia.

Triodia lanata, *sp. nova* (tab. v.). *Gramen caespitosum, caulibus geniculato-ascendentibus 30-50 cm. longis, foliorum laminis rigidis subulato-pungentibus patentibus intus basin versus lanatis 5-12 cm. longis, vaginis extus lanatis demum glabrescentibus, ligulâ e pilis longis constante, paniculâ sublaxâ, spiculis 5-7-floris, glumis omnibus sericeo-villosis, vacuis 10 mm. longis 3-nerviis acutis, glumâ floriferâ 7-8 mm. longâ truncatâ subtiliter 9-nerviâ, nervis ternatim ordinatis mediano dentes laterales subaequante.* In the scrub at Minnipa. Chiefly distinguished from *T. irritans* and *T. aristata* by the short bent stem, the shorter and woolly leaves, and the silky outer glumes. A "Porcupine Grass."

Poa nodosa, Nees. Thevenard Peninsula. Locally called "Shaking grass," from its likeness to **Briza minor*, L. I found the grain adhering to the palea in all the flowers examined, so that this species should be placed in the same section as *P. Billardieri* and *P. homomalla*.

Stipa elegantissima, Labill. Melrose (Dist. N).

Anthistiria imberbis, Retz. Observ. bot., v., 22 (1789). "Common Kangaroo Grass." All the leading authorities are

agreed that the name of *A. ciliata*, L.f., adopted by Bentham in the "Flora Australiensis" and by Mueller in his 1st and 2nd Census, must be abandoned. *A. ciliata* is an annual grass, native in India and introduced in South Africa, but not found in Australia, while *A. imberbis* is a perennial grass, distributed throughout Australia, India, and parts of Africa. Retzius' name is the oldest for this plant, with the exception of *Themeda triandra*, Forsk. (1775), but the generic name *Themeda* fell into disuse for over one hundred years and all attempts to revive it seem destined to failure, although it was not placed by the Botanical Congress of Vienna on the index of names to be rejected. The synonymy is fully dealt with by J. D. Hooker in Fl. Brit. Ind., vii., 212.

Aristida Behriana, F. v. M. Numerous in a paddock of ringed gums two or three miles north of Melrose. Apparently a very localized and comparatively rare grass. The ascending stems only 4-8 cm. long below the inflorescence and the rhizome thick and matted. The description in the "Fl. Aust." and in Tate's "Fl. Extratrop., S.A.," should be altered from "outer glumes nearly equal" to "outer glumes unequal, the lower about half as long as the upper." The description is correctly given by Mueller and Moore. Also at Mooloolo (Dist. S; S. A. White).

Cyperaceae.

Cyperus Iria, L. Near Tarcoola (Dist. W; J. W. Mellor). *C. Gunnii*, Hook, f. Myponga; Mount Barker. United by Mueller and Tate with *C. lucidus*, from which it differs by having the spikelets in dense globular heads. *C. pygmaeus*, Rottb. River Murray (Dist. M; H. H. D. Griffith). This species, and not the very similar *Scirpus Michelianus*, L., is supposed is be represented in Australia, but the Murray specimens have at least some of the glumes in each spikelet arranged irregularly round the rhachis, the style is 2-3-fid, and the glumes are 3-nerved, the two lateral nerves very faint. These three characters point to *S. Michelianus* rather than to *C. pygmaeus*.

Scirpus setaceus, L. Melrose (Dist. N). Nuts of the typical form, subglobular, not exceeding $\frac{3}{4}$ mm. in length, of a dull-white colour, with about 16 clathrate longitudinal ribs. In all the flowers examined only two stamens were found. *S. cernuus*, Vahl, ann. 1806 (*S. riparius*, Poir., ann. 1820), with still weaker stems and shorter involucral bract, from National Park, Belair, and Nuriootpa; the nut about the same size, shining, finely punctulate; both species growing in moist spots. *S. antarcticus*, L., ann. 1771 (*S. cartilagineus*, Poir., ann. 1820). Myponga; scrub between Murray Bridge

and Callington; Karoonda; Melrose; Robe. The nut broader and 1 mm. long, without any point, either brownish and smooth or dark-brown and punctulate-striate. Growing in dryer ground, with less slender stems, longer and more spreading involucral bract, and stiffer glumes.

Juncaceae.

Xerotes leucocephala, R. Br. Musgrave Ranges (Dist. C; S. A. White); Tintinara (Dist. T). *X. effusa*, Lindl. Gladstone (Dist. N).

Xanthorrhoea quadrangulata, F. v. M. Telowie Gorge (Dist. N); Moolooloo (Dist. S; S. A. White).

**Juncus capitatus*, Weig. Barossa Range; Bordertown (Miss Turner); Kangaroo Island.

Liliaceae.

Dianella revoluta, R. Br. Moolooloo (Dist. S; S. A. White).

Arthropodium minus, R. Br. Bordertown (Dist. T).

Thysanotus Patersonii, R. Br. Gawler Ranges (Dist. W; S. A. White).

Casuarinaceae.

Casuarina stricta, Ait. Some specimens of this Sheoak were found above Campbell Creek, at a fair elevation on Mount Remarkable, but most of them appeared to be dying, possibly as a result of the drought of 1914.

Proteaceae.

Grevillea Huegelii, Meissn. Moolooloo (Dist. S; S. A. White).

Hakea leucoptera, R. Br. Minnipa. Varies from the type in the perianth (especially the limb) and the pedicel pubescent with short appressed hairs. This appears to be *H. Kippistiana*, Meissn., a species established on Western Australian specimens and united by Mueller with *H. leucoptera*. The type is found in this State from Renmark to Spencer Gulf, and it would be well to distinguish the form with pubescent flowers, which I have also received from Woolshed Flat, near Quorn (Miss J. Mills), as var. *Kippistiana*. At Minnipa it is a shrub about 3 m. high, flowering and fruiting in November; the flowers, which grow in great profusion, are pure white when fresh. Leaves of both type and variety sometimes attain 9½ cm. in length. *H. flexilis*, F. v. M. Scrub at East Wellington.

Enchylaena villosa, F. v. M. Warramboo (Dist. L).

Bassia Birchii, F. v. M. Minnipa (Dist. L). A small undershrub about 20 cm. high; branches erect or spreading; the fruits in the Minnipa specimens have six rather unequal spreading spines, two of them connate towards the base and with a ridge on the perianth between them. *B. uniflora*, F. v. M. Murat Bay and north thereof. Stems procumbent, tomentum hoary, fruit oblique at base with a very short spine at one side of the summit and a hard tubercle at the other. Agrees exactly with specimens gathered at Port Vincent (Dist. Y). Of the form with fulvous tomentum I have a specimen from Port Lincoln (Dist. L; H. H. D. Griffith). *B. tricornis*, F. v. M. Renmark. Bentham gives the number of style-branches as three; in all the flowers examined I found only two.

Kochia decaptera, F. v. M. A few miles north of Murat Bay. An erect shrub about 1 m. high; stem and branches densely white-tomentose, as also the raised summit of the fruit; leaves linear, thick, green, 5-10 mm. long. Specimens from Dublin (Dist. A; H. H. D. Griffith) have the horizontal wing pink; linear-clavate glaucous leaves and tomentose stem and branches. This probably represents Tate's *K. pentatropis*, which he afterwards reduced to a form of *K. decaptera*. Specimens from Arkaringa (Dist. C; Miss Staer) have the stem and branches glabrous; leaves cylindrical, 10-13 mm. long. In drying, all the leaves turn black.

Threlkeldia diffusa, R. Br. Althorpe Island (Dist. Y; S. A. White). *Th. inchoata*. This is the correct name of *Th. obliqua* (these Transactions, xxxix., p. 94), as it appears imperative, under article 48 of the Vienna rules, to retain the original specific name, even if somewhat inappropriate, when a species is transferred to another genus.

Atriplex paludosa, R. Br., var. *appendiculata*, Benth. Both the type and the variety are found on Thevenard Peninsula. Flowers dioecious in my specimens and the small bladdery appendage of the variety occurs near the base of each valve (not of one only, as stated by Bentham), although frequently one falls off before maturity. Some specimens of *A. vesicaria*, Hew., brought by Captain White from the Musgrave Ranges, show the same caducity of the appendage, and unquestionably there is a close relation between the two species. *A. halimoides*, Lindl. Goat Island (Dist. Y; S. A. White); Telowie (Dist. N). *A. campanulata*, Benth. Berri; Mann Flat; Carrieton; Gladstone; Moolooloo. This species was united by Mueller with *A. angulata*, Benth., but in the

specimens from the above-named places, and from Broken Hill, I have never seen any with the exappendiculate perianth of *A. angulata*. *A. Muelleri*, Benth. "Annual Saltbush." North Park Lands of Adelaide; Woodville; Port Adelaide; Roseworthy (Dist. A); Gladstone (Dist. N).

AMARANTACEAE.

Trichinium seminudum, *sp. nova* (tab. vi.). *Herba perennis circiter 30 cm. alta, caulibus erectis vel ascendentibus ramosis pilosiusculis, foliis glabrescentibus, radicalibus lanceolatis in petiolum alatum angustatis cum petiolo 7-14 cm. longis, caulinis brevioribus latioribus vix petiolatis, spicis primum hemisphaericis demum ovoideis vel oblongis 4-5 cm. longis 3 cm. latis, bracteis bracteolisque ovato-lanceolatis acuminatis parce pilosis 8-9 mm. longis, illis brunneis his fere albis, perianthio 12-15 mm. longo prope basin constricto, segmentis apice albo-scariosis medio viridibus et villosis basin versus rigidis et fere nudis, duobus exterioribus truncato-emarginatis margine inferiore ciliolatis, interioribus acutis infra longe inflexo-ciliatis, tubo pubescente, filamentis inferne dilatatis tribus anantheris, stylo brevi glabro, ovario supra sparse piloso stipitato.* Minnipa. Should probably be placed in Series *Straminea* beside *T. alopecuroideum*, Lindl., which it somewhat resembles in habit, but the dividing line between *Straminea* and *Rhodostachya* is not so well marked as would appear from the text-books. Both *T. macrocephalum* (placed in *Straminea*) and *T. exaltatum* (placed in *Rhodostachya*) have, for instance, the inner perianth-segments "glabrous inside," strictly speaking, the difference being that the former has only a few of the long marginal hairs inflexed, while in *exaltatum* they form an intricate woolly mass which occupies the lower part of the convex inner surface of the segment. None of the hairs, however, rise from the inner surface itself, but only from the margins. The new species differs from all others in the glabrous condition of the outside of the lower part of the perianth.

T. alopecuroideum, F. v. M., var. nova *rubriflorum. Variat perianthio rubro, spicâ paulo angustiore (20-25 mm. latâ), cupulâ staminali pilis brevissimis ciliatâ.* Near Oodnadatta (Miss Staer, November, 1914). A very handsome plant on account of its long red spikes.

Alternanthera nana, R. Br. Oodnadatta (Dist. C: Miss Staer). *A. angustifolia*, R. Br. Oodnadatta (Miss Staer). Not previously recorded for South Australia, the nearest locality quoted being Sturt Creek, in North-western Australia.

PHYTOLACCACEAE.

Didymotheca thesioides, Hook. f. Karoonda (Dist. M).

Codonocarpus cotinifolius, F. v. M. North of Murat Bay (Border of Dist. L and W). Mr. B. P. Bowering, the local schoolmaster, says there are only a few of these trees in the locality.

AIZOACEAE.

**Mesembryanthemum crystallinum*, L. "Ice Plant." Spreading on the sandy soil near Murat Bay.

**Galenia secunda*, Sond. Received by the Agricultural Department from Port Germein, where it is called "Californian lucerne," because the seed is believed to have come in the ballast of a ship from California. A South African weed, recorded in Victoria in 1902, but not found hitherto in South Australia.

CARYOPHYLLACEAE.

**Silene nocturna*, L. Renmark.

**Spergula arvensis*, L. "Corn Spurry." Karoonda.

**Herniaria hirsuta*, L. Mannum. This Mediterranean plant has already been noted for Woolshed Flat and Wallaroo, but has not hitherto been collected on the Murray.

PAPAVERACEAE.

**Papaver Argemone*, L. Melrose. Only one specimen of this European poppy (not hitherto recorded for South Australia) was found.

CRUCIFERAE.

Menkea villosula (F. v. M. et Tate), J. M. Black. This alteration of the specific name of *M. hispidula* (these Trans., xxxix., 830) has become necessary under Art. 48 of the rules of nomenclature adopted at the Vienna Congress, because Professor Ewart finds, after comparison with Helms' specimens in the National Herbarium of Victoria, that *M. hispidula* is identical with *Capsella villosula*, F. v. M. et Tate. His examination of the Melbourne specimens confirms the necessity of transferring the species to *Menkea*.

Stenopetalum sphaerocarpum, F. v. M. Minnipa (border of Dist. L and W). Slender annual in fruit (November); growing in the shelter of Porcupine Grass *(Triodia lanata)*.

**Sisymbrium orientale*, L. "Oriental Rocket" or "Wild Mustard." Grows with extreme luxuriance in the Trans-Murray scrub near Karoonda.

Lepidium fasciculatum, Thell. Renmark; Gladstone. Differs from *L. ruderale*, L., in the short dense fruiting raceme, the pod cuneate towards the base, and the four minute white petals about half the length of the sepals. *L.*

foliosum, Desv. Little Althorpe Island (Dist. Y; S. A. White). Valves of pod wingless and fruiting pedicels sometimes elongated.

**Carrichtera annua* (L.), Prantl. Sent to Department of Agriculture from Port Pirie, and appears to have established itself near that town. Spain, Eastern Mediterranean region, and Mesopotamia.

Crassulaceae.

Tillaea acuminata, F. M. Reader. This species is widely distributed in South Australia, and is distinguished from *T. Sieberiana*, Schult., ann. 1825 (*T. verticillaris*, DC., ann. 1828), by its pentamerous flowers, sessile or subsessile, its broad abruptly acuminate scarious-striate sepals and its long-beaked carpels, which (like the petals) are quite as long as the sepals. In the flower the beaks protrude conspicuously beyond the sepals. The carpels are tuberculate in the lower half, a peculiarity not found in *T. Sieberiana*. The latter species has almost always a few pedicellate flowers springing from the clusters of sessile ones; its flowers are tetramerous, and the sepals are narrower, acute rather than acuminate, and considerably exceed both the petals and the small obtuse short-beaked carpels. (See figures in pl. vii.) Both these species are common. I have specimens of *T. Sieberiana* from sandhills at the Grange (near Adelaide), Clarendon, scrub between Murray Bridge and Callington, Gladstone, Beetaloo, Melrose, Loxton, Karoonda, Robe, and Kangaroo Island; and of *T. acuminata* from Black Hill (near Adelaide), Bugle Ranges, Halbury, Melrose, Woolshed Flat (near Quorn), Berri, Blanchetown, Renmark, Karoonda, Taplan, Port Lincoln, and Minnipa. *T. recurva*, Hook. f. I have only found this as a rare plant in the Onkaparinga, the North Para at Nuriootpa, and the Glenelg River. *T. purpurata*, Hook. f., also appears to be very rare. Var. *pedicellosa*, F. v. M., of *T. macrantha*, Hook. f., varies from the type by the very long pedicels of some of the flowers, erect growth, and fewer stems. The typical form has the stems often prostrate for a short distance and rooting at the nodes. Ewart follows Mueller's later opinion in raising var. *pedicellosa* to the rank of a species, but some specimens from Brighton, Strathalbyn, Willunga, and Clarendon appear intermediate, and we have not in this case any difference in the flowers to fall back upon in case of doubt. Hooker, in his description of *T. macrantha* (Fl. Tasm., i., 145), says: "Squamis hypogynis nullis," and Bentham is silent on this point. There is, however, a crimson scale at the base of each carpel, although in the dried state the colour is usually lost and the scale is difficult to find.

The scale occurs in the var. *pedicellosa* (which I have from Burnside, Port Lincoln, Robe, and Kangaroo Island), as well as in the type.

PITTOSPORACEAE.

Billardiera cymosa, F. v. M. Karoonda; Lameroo (Dist. M). Var. *sericophora*, Benth. Strathalbyn; Port Lincoln.

Pittosporum phillyraeoides, DC. In the dry country north of Murat this is only a shrub, not above 2 m. high, leaves small (2½-5 cm. long), fruit unripe, but much smaller than the unripe fruit gathered about the same date on typical trees at Minnipa. This is doubtless the same form as was found by Captain White in the Everard Range, with hoary pedicels and small leaves.

LEGUMINOSAE.

Acacia Oswaldii, F. v. M. Minnipa and Chillundie, with lanceolate phyllodia; also at Murat Bay (with oblong-lanceolate phyllodia), where it is known as "Prickly Myall." At Iron Knob it has linear-lanceolate phyllodia, very pungent-pointed, and is known as "Dead Finish Myall." Some specimens from the Murray have the pungent point transferred to one corner of the oblique summit of the curved phyllodium, which thus presents a curious cimitar-like appearance. *A. continua*, Benth. Moolooloo (Dist. S). *A. aneura*, F. v. M. "Mulga." Iron Knob (Wm. C. Newbold). Phyllodia narrow, 4-9 cm. long. This species appears to flower from July to November. *A. Burkittii*, F. v. M. Iron Knob (Wm. C. Newbold). Flowers July-September; pods (hitherto unknown) become ripe in November. This species, the type of which was collected near Lake Gilles, also occurs near Broken Hill. Mr. J. H. Maiden, at whose instance the pods were obtained, proposes to describe it fully and to illustrate it in his "Forest Flora of New South Wales." *A. colletioides*, A. Cunn. Dublin scrub (Dist. A; H. H. D. Griffith). *A. rigens*, A. Cunn. Gawler Ranges (Dist. W; S. A. White). *A. rupicola*, F. v. M. Morialta Gully; Beetaloo. Specimens from these two places have the phyllodia 15-25 mm. long; peduncles only 5-6 mm. long. From Port Lincoln we have typical specimens, with peduncles usually longer than the phyllodia. *A. sentis*, F. v. M. Marino (Dist. A). A few shrubs, about 2 m. high, on a hillside near the Cement Works, also one shrub on the Henley Beach road. Probably the most southerly *habitat* of a species which extends north to Oodnadatta and Central Australia. Also Gladstone (Dist. N); a few specimens remaining on the roadsides, and flowering vigorously in October, 1914, in spite of the terrible drought of that year. In Baroota it is a neat,

ornamental shrub, branching at some distance from the ground, and growing in clearings among the denser scrub; in the Baroota Creek it becomes a small tree. Also north-west of Port Augusta (Dist. W; S. A. White). *A. acinacea*, Lindl. Mount Thisbe, K.I. (Dist. K; H. H. D. Griffith). *A. dodonaeifolia*, Willd. Marino, near Cement Works (Dist. A). Grown as a hedge at Port Elliot and Victor Harbour, and said to be indigenous in that locality also. *A. iteaphylla*, F. v. M. Telowie Gorge (Dist. N). A shrub with drooping branches. Woolshed Flat (on the border of Dist. N and S; Miss J. Mills). *A. brachystachya*, Benth., ann. 1864 (*A. cibaria*, F. v. M., ann. 1882). Tarcoola (Dist. W; J. W. Mellor); Mount Gunson (Dist. W; Mrs. Beckwith); Oodnadatta (Dist. C; Miss Staer); Everard and Musgrave Ranges (Dist. C; S. A. White). A long-leaved Mulga. *A. frumentacea*, Tate. Ruby Gap, Hale River; between Love Creek and Deep Well (S. A. White). All these places are in Central Australia. Tate quotes Dist. C for this species in his "Flora of South Australia," but all the localities mentioned in the report of the Horn Expedition appear to be in Central Australia (Northern Territory). It is evidently a very handsome desert acacia.

Daviesia genistifolia, A. Cunn. Strathalbyn (Dist. A).

Lotus villosa, Smith. Victor Harbour (Dist. A); Eyre Peninsula (Dist. L; S. A. White).

Dillwynia hispida, Lindl. Scrub near Murray Bridge; East Wellington (Dist. M). *D. uncinata* (Turcz.), J. M. Black (*D. patula*, F. v. M.). Near Murray Bridge (H. H. D. Griffith); Karoonda (Dist. M). The original dates of publication of these species are:—*Eutaxia uncinata*, Turcz., 1853; *E. sparsifolia*, F. v. M., 1854; *E. patula*, F. v. M., 1861.

Pultenaea densifolia, F. v. M. Murray Bridge (Dist. M; H. H. D. Griffith). *P. largiflorens*, F. v. M. Hills near Gladstone; Telowie Gorge (Dist. N). In specimens from Black Hill, near Adelaide, most of the leaves are arranged in threes. *P. tenuifolia*, R. Br. Strathalbyn (Dist. A); Port Lincoln (Dist. L). Var. *glabra*, Benth. Warunda (Dist. L).

Templetonia retusa, R. Br. Wedge Island (Gambier Isles; S. A. White). *T. egena*, Benth. Between Booleroo and Tarcowie (Dist. N). *T. aculeata*, Benth. Between Gladstone and Bundaleer (Dist. N).

Swainsona procumbens, F. v. M. "Broughton Pea." This plant is still to be found along the Gladstone and Laura railway, and was no doubt at one time common on the plains. The handsome flowers are at first purple, changing to blue,

and the standard is bent backwards almost at right angles to the claw, at the summit of which are two flat, white, rounded confluent callosities. This species should therefore, at least as regards South Australian specimens, be removed to Bentham's section B in the key to *Swainsona*. *S. Burkei*, F. v. M. Oodnadatta (Dist. C; Miss Staer).

Psoralea eriantha, Benth. Oodnadatta (Dist. C; Miss Staer).

Cassia artemisioides, Gaud. Gladstone; Telowie Gorge (Dist. N); Arkaringa (Dist. C; Miss Staer). *C. Sturtii*, R. Br. Marino (Dist. A); Telowie (Dist. N).

**Medicago denticulata*, Willd. Melrose; Gladstone; Mannum. **M. reticulata*, Benth. Gladstone. **M. minima*, L. Mannum; Gladstone; Napperby. **M. truncatula*, Gaertn. Mannum.

**Trifolium glomeratum*, L. Melrose.

Zygophyllaceae.

Zygophyllum fruticulosum, DC. Minnipa; Yanninee; north of Murat Bay. Cells of fruit usually 1-seeded, but sometimes with two seeds and often barren. *Z. apiculatum*, F. v. M. Dublin (Dist. A). *Z. ovatum*, Ewart et White. Loxton; Alawoona; Minnipa; Poochera. First record for South Australia; grows also in Western Australia and Victoria (Mildura). The small flowers are deflexed from the time they open; capsule opening loculicidally, the endocarp of each 1-2-seeded cell separating in two valves.

Nitraria Schoeberi, L. Growing in natural hedges just behind the sandy shores of Murat Bay.

Rutaceae.

Boronia inornata, Turcz., ann. 1852 (*B. clavellifolia*, F. v. M., ann. 1854). Between Murray Bridge and Callington (Dist. M); near Port Broughton (Dist. N); Yeelanna (Dist. L; T. G. B. Osborn). *B. coerulescens*, F. v. M. Near Murray Bridge; Karoonda (Dist. M).

Euphorbiaceae.

Poranthera triandra, *sp. nova* (tab. vii.). *Parva planta annua 2-4 cm. alta, caule rigido erecto, ramis divaricatis, foliis obovatis vel oblanceolatis planis 2-7 mm. longis, caulinis oppositis vel alternis petiolatis, floralibus alternis, stipulis lanceolatis integris, pedicellis fructiferis elongatis, floribus minimis albis, calycis segmentis petalis staminibusque 3 (floribus foemineis rarius tetrameris), glandulis florum foemineorum in discum hypogynum sexlobatum coalitis, stylis apice emarginatis, seminibus brunneis verrucosis, embryone*

curvo cylindrico. Yeelanna (T. G. B. Osborn, November, 1915). Specimens apparently from Ardrossan (J. G. O. Tepper, November, 1879) are in the Tate Herbarium, placed under *P. microphylla*, which the new species resembles considerably in habit. It is removed from all other species by its trimerous flowers, and styles merely notched at the summit, but it has the anthers and other characters of *Poranthera*, and it seems better to place it there and widen the generic definition rather than invent a new genus for its reception. In several Euphorbiaceous genera there is considerable latitude allowed in the number of floral parts.

SAPINDACEAE.

Dodonaea bursariifolia, Behr et F. v. M. Yeelanna (Dist. L). *D. stenozyga*, F. v. M. Minnipa (Dist. L); Loxton (Dist. M).

RHAMNACEAE.

Trymalium Wayii, F. v. M. et Tate. The localities for this beautiful little shrub, which is peculiar to our State, are:—Gorge of the Onkaparinga, above Noarlunga (where the type was collected by Tate about 1881); south bank of Torrens River, about half-a-mile above the weir; Rocky River, near Narridy, and Barunga Range (S. Dixon); near Gladstone; Kingscote, Kangaroo Island (H. H. D. Griffith). It appears always to grow near water.

Stenanthemum leucophractum, Reiss. Gladstone (Dist. N).

Spyridium subochreatum, Reiss. Typical specimens of this shrub grow at Karoonda, with stipules half as long as the leaves. *S. bifidum*, F. v. M. Between Gladstone and Beetaloo (Dist. N).

Cryptandra amara, Smith. Bundaleer Hills (Dist. N).

MALVACEAE.

Hibiscus Drummondii, Turcz. Minnipa. A slender shrub about 1 m. high, growing in the scrub on the western side of the railway; petals lilac with a large purple blotch inside near the base. Hitherto recorded only from Western Australia. Professor Ewart kindly confirmed the determination by comparison with specimens in the National Herbarium of Victoria.

**Malva parviflora*, L. Berri.

DILLENIACEAE.

Hibbertia stricta, R. Br. Coomunga. A small form where the sepals and leaves are villous with long, loose hairs; leaves crowded, becoming almost glabrous with age; ovules

only three in each ovary. Near var. *hirtiflora*, Benth., except for the number of ovules. Var. *glabriuscula*, Benth., occurs at Wanilla, the specimens being similar to others from Fulham, Blackwood, and Pinnaroo. *H. fasciculata*, R. Br. Karoonda (Dist. M).

FRANKENIACEAE.

Frankenia tetrapetala, Labill. (?) This is in many ways a doubtful species (see Fl. Aust., i., 152, and Diels, Fragm. Phyt. Aust. occid. 390), but a small ashy-grey plant from Thevenard Peninsula is near it and is almost certainly the same as the specimens mentioned by Diels from Israelite Bay, Eucla, and Esperance Bay. Branches mostly ascending: flowers white, tetramerous or pentamerous, usually terminating short branchlets, rarely axillary or in the forks, style-branches and placentas two, with only one ovule to each placenta; leaves 2-3 mm. long, sessile and united by a conspicuous ciliolate sheath. All the flowers on some specimens are tetramerous and on others all are pentamerous. Until botanists who have the opportunity examine carefully Labillardière's types and compare them with specimens from the Great Bight or elsewhere it will be impossible to come to any satisfactory decision on this question.

THYMELAEACEAE.

Pimelea trichostachya, Lindl. Minnipa (border of Dists. L and W).

MYRTACEAE.

Eucalyptus cladocalyx, F. v. M., ann. 1852 (*E. corynocalyx*, F. v. M., ann. 1860). "Sugar Gum." Wanilla and thereabouts, but on Eyre Peninsula it is a lower, more straggling tree than in the North and is often reminiscent of Peppermint (*E. odorata*) on the Adelaide foothills.

E. calycogona, Turcz. Scrub between Murray Bridge and Callington; Warunda, E.P. Fruits urn-shaped, about 10 mm. long, strongly 4-ribbed; leaves often black-dotted and glossy. Var. *gracilis*, Maiden (*E. gracilis*, F. v. M.). Minnipa. A fair-sized mallee, with smooth, white bark on the upper stem and branches, and rough, dark, peeling bark below; fruits small, glossy, sometimes slightly angled; leaves usually narrow and black-dotted. Baroota—the same, but a taller tree, called "Red" or "White Mallee" according to the colour of the bark. Port Vincent, Ardrossan, Arno Bay, Milang Road, between Murray Bridge and Callington—usually a dwarf mallee in these places.

E. diversifolia, Bonpl., ann. 1813 (*E. santalifolia*, F. v. M., ann. 1855, partly). East Wellington; Coorong (S. A.

White); Port Lincoln; Goat Island, Y.P.; Kingscote and American Beach, K.I. The fruits are often mealy-white when fresh.

E. bicolor, A. Cunn., ann. 1835 (*E. largiflorens*, F. v. M., ann. 1855). Maanum; Berri; Settlers' Bend; Renmark.

E. Behriana, F. v. M. Nuriootpa (Dist. A).

E. fasciculosa, F. v. M. Black Hill, near Adelaide; Brownhill Creek; Torrens Gorge; Bridgewater; Willunga; National Park, Belair; Greenhill Road. A small straggling tree, often with several bent stems (like a mallee); outer bark rough, brown, deciduous; inner bark smooth, white. Formerly included in *E. paniculata*, Smith, which is an erect tree of New South Wales and Queensland. *E. fasciculosa* is confined to South Australia.

E. hemiphloia, F. v. M. "Box Gum." Numerous about Melrose and on the foothills of Mount Remarkable, where its distribution extends down to the creek, so that it is often found growing within a few yards of the Red Gum (*E. rostrata*). In the field *E. hemiphloia* is distinguished by its lofty stature, its usually straight and single stem, and its light-brown bark, streaked longitudinally, but in the herbarium it is often hard to separate from large-fruited forms of Peppermint Gum (*E. odorata*).

E. leucoxylon, F. v. M., var. *pauperita*, J. E. Brown. "Scrubby Blue Gum." Hamilton; Kapunda; Nuriootpa; near Gladstone and Beetaloo.

E. incrassata, Labill., var. *dumosa*, Maiden (*E. dumosa*, A. Cunn.) Probably the commonest mallee about Murat Bay and north thereof; native name "gheelya." Grows 3 to 8 m. high; bark smooth and white except at base of tree, where it is dark and rough; buds of the "egg-in-egg-cup" shape; fruits small. Very near some forms of *E. oleosa*, but the anthers oblong with parallel cells. Also at Kingscote, K.I. Var. *conglobata*, Maiden. Port Lincoln. A small tree with very thick, stiff, broad leaves. Var. *angulosa*, F. v. M. Port Vincent; Edilillie; Arno Bay, with very large fruits, 17 mm. long; also in scrub between Murray Bridge and Monarto; Square Waterhole; Renmark, Karoonda—the fruits in all these latter places rather smaller, 12-13 mm. long. In the Cis-Murray scrub this is a "dwarf mallee," 3 to 5 m. high, distinguished from other neighbouring species of similar height and appearance by the smooth bark of the stem, which peels off and hangs down in long strips on the ground. In the Trans-Murray scrub (at Karoonda) it is a small "whipstick mallee," rarely exceeding 2 m. in height, with the bark peeling at the base of the stem in the same way.

E. oleosa, F. v. M., is apparently the tallest mallee at Minnipa, 5 to 8 m. high, the stems and branches white, with rough bark only near the base of the tree. Also at Tooligie, Warramboo, Wudinna, and north of Murat, but not so tall at those places, and often only a small mallee.

Darwinia Schuermannii, Benth. Port Lincoln, Coomunga. In all the flowers examined the number of ovules was 8-10, not 2, as stated by Bentham.

Melaleuca uncinata, R. Br., is numerous along the railway from Edillillie to Minnipa. The "Broom-bush" of Eyre Peninsula and the Murray country is either *M. uncinata* or *Baeckea Behri*, F. v. M., while in the North "Broom-bush" usually means *Templetonia egena*, Benth. *Pholidia scoparia*, R. Br., is also a small erect broomlike shrub growing in dry country, but at Murat it has for some reason obtained the name of "Candle-bush." *M. squamea*, Labill. Myponga (Dist. A). *M. ericifolia*, Smith. Torrens Gorge (Dist. A). *M. acuminata*, F. v. M. Fairly common in the scrub at Karoonda. All my specimens, from there and elsewhere, have conspicuous translucent oil-glands on the lower surface of the leaves.

Baeckea crassifolia, Lindl. Karoonda (Dist. M). Petals light-violet; anthers purple. *B. Behri*, F. v. M. Barossa Range (Dist. A): Sherlock: Lameroo (Dist. M). *B. ericaea*, F. v. M. Kangaroo Island (Dist. K: H. H. D. Griffith).

Leptospermum laevigatum, var. *minus*, F. v. M. Karoonda. Also at Mulgundawa and Port Lincoln.

Calythrix tetragona, Labill. Moolooloo (Dist. S).

Umbelliferae.

Eryngium rostratum, Cav. Murray Bridge (Dist. M).

Plumbaginaceae.

**Statice Thouini*, Viv. Received by the Agricultural Department from a farm near Yorketown, Y.P., but has apparently not established itself. Eastern Mediterranean region, North Africa, and Southern Spain.

Loganiaceae.

Logania linifolia, Schlecht. Karoonda (Dist. M).

Apocynaceae.

Alyxia buxifolia, R. Br. This handsome shrub is numerous in the scrub at Minnipa, which is nearly forty miles from the sea, as the crow flies, so that it is not always a maritime plant.

BORAGINACEAE.

Halgania lavandulacea, Endl. Waikerie; Karoonda; Lameroo; Pinnaroo (Dist. M). A shrub with very sticky leaves. *H. cyanea*, Lindl., ann. 1839 (*H. strigosa*, Schlecht., ann. 1847). Common at Karoonda and Minnipa.

SOLANACEAE.

Solanum hystrix, R. Br. Beautiful Valley; Murat Bay. Berry to 3 cm. diameter. The type of this very prickly plant was gathered by Robert Brown on February 4, 1802, at Petrel Bay in the Isle of St. Francis. It appears to be confined to the country near the Great Bight. *S. coactiliferum*, J. M. Black. Minnipa; Murat Bay; Renmark. The coastal specimens have broader, thicker, and more densely tomentose leaves; pedicels solitary or twin; flowers all tetramerous, but in the Renmark specimens one of the four corolla-lobes is notched at the summit. Called "koomba" by the natives at Murat Bay. **S. cinereum*, R. Br. Roadside near Melrose. Hitherto this New South Wales species has only been recorded from the Greenhill Road, near Adelaide.

Lycium australe, F. v. M. Bundaleer Hills; Orroroo (Dist. N).

LABIATAE.

Westringia Dampieri, R. Br. I follow Maiden (Trans. Roy. Soc. S.A., xxxii., 267) in merging *W. rigida*, R. Br., in this species, although I have not found any specimens in South Australia with the leaves in whorls of four, but always in threes. Two very different forms grow on Thevenard Peninsula. One is a low intricate shrub, with very short leaves (4-6 mm.) and small flowers: the other form grows close to the sea, and stands about 1 m. high, with erect or spreading branches, the leaves 10-20 mm. long, and the corolla about 14 mm. long. I have very similar specimens from Kangaroo Island, with some of the leaves 30 mm. long.

Teucrium sessiliflorum, Benth. Dublin scrub (H. H. D. Griffith; Dist. A).

SCROPHULARIACEAE.

Veronica peregrina, L. Renmark (Dist. M). In moist spot near river.

MYOPORACEAE.

Myoporum brevipes, Benth. Murat Bay; Coorabie (Fowler Bay). Professor Ewart says these specimens are "close to, if not identical with *M. brevipes*." They differ from Bentham's description in the whole plant densely tuberculate, pedicels 1-6 in the axil, corolla slightly hairy inside, ovary 2-4-celled, and the fruit globular (as in *M. parvifolium*,

Benth.) not oblong. A small erect shrub, about 50 cm high; corolla white, somewhat two-lipped, with pink spots on the lower lip; leaves 6-18 mm. long. Also Murray Bridge (H. H. D. Griffith), with smaller leaves and less tuberculate.

Pholidia Weldii, F. v. M. Minnipa; Murat Bay and north thereof; Kingscote, K.I. (Dist. K; H. W. Andrew). The Kangaroo Island and Murat specimens have smaller leaves than those gathered at Minnipa; all are strongly tuberculate on leaves and branches. In the fresh flower there is a deep impression or hollow in the broad, almost reduplicate lowest lobe of the corolla. Near Murat the shrub is slightly above 1 m. high. *Ph. Behriana*, F. v. M. Specimens from Cummins and Yeelanna have the upper leaves conspicuously ciliate and the lower ones are sometimes 25 mm. long. *Ph. crassifolia*, F. v. M. Murray Bridge; Lameroo (Dist. M); Warramboo; Minnipa.

Eremophila rotundifolia, F. v. M. Tarcoola (Dist. W; J. W. Mellor). *E. Brownii*, F. v. M. Dublin scrub (Dist. A; H. H. D. Griffith). *E. Duttonii*, F. v. M. Mount Gunson, Dist. W; Mrs. Beckwith); Minnipa.

Rubiaceae.

**Galium Aparine*, L., var. *minor*, DC. Woolshed Flat, near Quorn (Miss J. Mills); Campbell Creek, Melrose. This clinging plant, called in England "Cleavers," was recorded from Mount Gambier by Bentham in 1866. **G. murale*, DC. This little alien, which seems to have great facility in distributing its seeds, was found fruiting in the scrub at Minnipa in November.

Goodeniaceae.

Dampiera stricta, R. Br. Myponga (Dist. A). *D. lanceolata*, Cunn. Longwood (Dist. A); Minnipa (Dist. L).

Goodenia glauca, F. v. M. I have this species from Renmark, Gladstone, Arkaringa, and Broken Hill, and always var. *sericea*, Benth. The indusium, although glabrous on the outer face, is appressed-silky on the inner and the style is hairy. *G. pusilliflora*, F. v. M. Brighton, Dublin (Dist. A); Halbury, Gladstone, Telowie Gorge (Dist. N).

Scaevola spinescens, R. Br. Minnipa (Dist. L). *S. aemula*, R. Br. (Dist. N) and *S. humilis*, R. Br., both grow at Gladstone. These two species are certainly rather difficult to distinguish and it might be better, as Bentham suggests, to treat *humilis* as a variety only. *S. aemula* has longer and less prominently toothed leaves, a soft pubescence which may almost wear off through age, and usually longer spikes and corollas. It is a larger plant and has a wide range throughout

the State. *S. humilis* is essentially northern in its habitat. Puzzling forms, almost intermediary, occur on Kangaroo Island, where Tate records the existence of both species.

COMPOSITAE.

Helipterum floribundum, DC., var. *Sturtianum*, Benth. Dublin scrub (H. H. D. Griffith); Gawler Ranges (S. A. White); Telowie; Pirie; Karoonda; Warramboo. This is the form with straw-coloured outer bracts of the involucre and pappus-bristles united only at base. The spreading snow-white inner bracts of this "everlasting" are a marked feature in many parts of the Murray Scrub and Eyre Peninsula. The type, with all the bracts white and the pappus-bristles dilated and united in their lower halves, is found chiefly in our Far North—Mount Lyndhurst, Oodnadatta, Tarcoola, Mount Gunson, Gawler Ranges, Arkaringa, Everard Range, River Finke. In these Transactions, xxxvi., 23, pl. ii., it was sought (I now think unnecessarily) to distinguish this form as var. *tubulipappum*. The specimens vary in size, and there are small intermediate forms from the Murray and Wallaroo, with all the bracts white but the pappus-bristles united only at base. *H. corymbiflorum*, Schlecht. This beautiful little plant often covers the ground along the banks of the Murray with a carpet of "white everlastings," as it also does in many of our northern districts. At Melrose it grows on the flats among the box-gums.

Athrixia tenella, Benth. Specimens from Edillillie have the upper part of the stems more or less clothed with erect or spreading bracts similar to those of the involucre. This character shows an approximation to the Western Australian *A. Croniniana*, F. v. M., but the pappus is normal.

Cratystylis conocephala, S. Moore, in Journ. Bot., xliii., 138, ann. 1905 (*Olearia conocephala*, F. v. M.; *Pluchea conocephala*, F. v. M.; *Stera conocephala*, Ewart et Rees). Common near Murat Bay and inland towards Chillundie. The conical heads are very fragile, finally falling from the branchlets and the bracts separating from the receptacle. The flowerheads seem to be constantly semi-dioecious or dioecious, the bisexual (or male?) corollas swollen towards the summit by the fertile, connate anthers, the female corollas cylindrical with the anthers abortive and free. (See pl. vii.) The pistil of the bisexual flowers appeared perfect, but it was too early in the season (November 11) to make certain on this interesting point. A densely-branched, compact shrub about 1 m. high, called locally "Bluebush," and so closely simulating in habit the other Bluebush of our northern and north-eastern country (*Kochia sedifolia*, F. v. M.) that at a short

distance it would be impossible to distinguish them. In view of the unisexual character of many, if not of all the flowers, it is evident that Moore's generic description must be partially altered.

Gnephosis skirrophora, Benth. Minnipa; Wudinna: Cape Thevenard.

Angianthus Whitei, J. M. Black. Broken Hill, N.S.W. (A. B. Black). As this plant has now been found so close to our eastern border, and as the type comes from Corunna Station, E.P., it probably inhabits some of the intervening country (Tate's District S).

Podolepis Siemssenia, F. v. M. Minnipa. *P. rugata*, Labill. Karoonda: Loxton (Dist. M). *P. acuminata*, R. Br. Gladstone (Dist. N).

Helichrysum Tepperi, F. v. M. Port Lincoln (Dist. L): Minnipa (Dist. L or W); Alawoona (Dist. M). *H. retusum*, Sond. et F. v. M. (including *H. decurrens*, F. v. M.). Karoonda; Lameroo; Murray Bridge; Gladstone; Strathalbyn; Nuriootpa; Port Lincoln; Yeelanna; Hog Bay, K.I. All the efforts I have made to distinguish satisfactorily these two species have failed, and I think they should be united. Mueller first sought to distinguish them by stating (Trans. Phil. Inst. Vict., iii., 59) that *H. decurrens* "differs from *H. retusum* in shorter more wrinkled leaves, with broader decurrent lines, in neither shining nor glabrous nor heterogamous flowerheads, and in more copious pappus-bristles." Later, in Fragm. viii., 46, he adopted another formula:—"Ab *H. retuso* distinguendum est capitulis paulo longioribus apice magis apertis, squamis involucri minus flavescentibus nunquam laxis." As regards the supposed presence of female flowers in *H. retusum* and their absence in *H. decurrens*, out of ten specimens examined only two (from Murray Bridge and Kangaroo Island) had no female flowers, and these two were not distinguishable by any other characteristic from specimens which had both bisexual and female flowers in each head. The leaves, which vary from 5 to 15 mm. in length and are usually spreading, have a narrow groove along the upper surface and a small point which is more or less recurved, so that the leaf appears either truncate or notched at the summit. The upper-surface varies from rough to almost smooth, and the margins are always more or less revolute, sometimes almost hiding the tomentose under-surface. The decurrent lines are often as long as the leaf itself and are always conspicuous, at least below the young leaves, for the prominence or otherwise of the lines is almost entirely a question of the age of the leaf, just as the looseness or otherwise of the involucral bracts is a matter of floral

development. The head contains 10-13 flowers, of which 1-3 are usually female, 4-toothed, and without pappus: rarely all are bisexual. The involucral bracts vary from snow-white (like those of *Cassinia laevis)* to straw-colour. *H. adnatum*, with which *Ozothamnus retusus* was united by Bentham in Fl. Aust., iii., 629 (he has not noticed *O. decurrens* in that work), appears to be a distinct species with short, rather acute, erect leaves, adnate to the branch usually for the whole of their length (see J. H. Maiden, Illust. N.S.W. Plants, 23, pl. 8), but I have not seen any specimens from South Australia. As regards priority of specific name, *H. retusum* and *H. decurrens* are both of the same date—F. v. M., Fragm., viii., 46 (1873)—but the original descriptions are:—*Ozothamnus retusus*, Sond et Muell. in Linnaea, xxv., 510 (1852); *O. decurrens*, F. Muell., in Trans. Phil. Inst. Vict., iii., 59 (1859). *H. Jessenii*, F. v. M. To the stations mentioned by Mueller in Vict. Nat., vii., 48, for this species—River Murray, Gawler, Lake Alexandrina, Burra, Wirrabara, Port Augusta, Port Lincoln—may now be added: Halbury, Gladstone, Napperby, Telowie, Melrose, Whyte-Yarcowie, Meribah, Lake Gairdner, Gawler Ranges. For the closely-allied species, *H. hyalospermum*, F. v. M.:—Burnside, Kapunda, Melrose, Tarcowie, Gawler Ranges.

Calotis scapigera, Hook. Port Adelaide River (Dist. A; H. H. D. Griffith).

Olearia rudis, F. v. M. Karoonda. Extreme form of var. *glabriuscula*, Benth. Almost without hairs or roughness, but otherwise like the type.

Humea squamata, F. v. M., was common at Karoonda, but only budding in early October.

Lagenophora Billardieri, Cass. Campbell Creek, Melrose (Dist. N).

Craspedia globosa, Benth. This handsome and apparently rare plant was found in bud on the banks of Campbell Creek, Melrose, in the middle of October.

Brachycome tesquorum, *sp. nova* (tab. viii.). *Herba perennis tota glanduloso-hispidula basi lignea, caulibus erectis ramosis, foliis rigidulis oblanceolatis 2-3 cm. longis acute paucidentatis trinerviis, nervis infra prominentibus, pedunculis elongatis subcorymbosis, involucri bracteis oblongis margine late scariosis laceratis, ligulis florum marginalium conspicuis lilacinis, acheniis obovatis compressis margine incrassatis exalatis pilis uncinatis conspersis utrinque bicostatis, pappo nullo.* Oodnadatta (Miss Staer); Glen Ferdinand, Musgrave Ranges (S. A. White). Belongs to Section

Paquerina, and appears nearest to *B. angustifolia*, A. Cunn., but has three-nerved leaves with a few long sharp teeth or lobes and ribbed achenes.

Senecio magnificus, F. v. M. Pinnaroo; Karoonda (Dist. M); Oodnadatta; Everard Range (Dist. C). *S. brachyglossus*, F. v. M. At Renmark is a form with involucres 7-8 mm. long, of about 12 bracts: outer female flowers about 10, with a very short ligule not exceeding the style-branches; inner bisexual flowers 20-25. The heads correspond fairly with var. *major*, Benth., but the Renmark specimens are slender, few-flowered, with leaves nearly entire, and only about 12 cm. high.

**Centaurea melitensis*, L. "Maltese Cockspur." Yaninee.

**Hedypnois cretica*, Willd., is found at Gladstone in the form with glabrous involucral bracts and long diffuse stems. Moolooloo, ordinary form (S. A. White).

**Crypostemma calendulaceum*, R. Br. "Cape Dandelion." Forming great yellow patches on the slopes of Mount Remarkable in October.

**Carduus tenuiflorus*, Curt. To the localities already given must be added Melrose, Robe, and Kangaroo Island.

**Lactuca saligna*, L. "Willow Lettuce." Murray Bridge as a new locality.

**Sonchus maritimus*, L. Henley Beach; Glenelg; Port Noarlunga; Port Elliot; Robe; Port MacDonnell. I don't know whether it is found on the seacoast north of Adelaide. Probably the plant referred to by Bentham in Fl. Aust., iii., 680, as a maritime variety of *S. oleraceus*, L., which it resembles in the achenes. In the Nat. Fl. of S.A. I called it var. *littoralis* of *S. asper*, but was not then aware that it was perennial, with long slender subterranean stolons penetrating the sand and forming new plants. In the South Australian specimens the leaves vary from almost entire, with small auricles, to sinuate-pinnatifid with large rounded auricles, and the achenes have usually 3-5 longitudinal ribs, the middle one most prominent, but with few or no transverse rugosities, which are also obsolescent in some Mediterranean forms. Our plant varies in height from 30 to 60 cm., and is often course and stout, the leaves bordered by spiny teeth. As this species is not mentioned by the early navigating botanists of Australia, it is very probably, like *Cakile maritima*, an introduction which has spread rapidly along our coasts. F. M. Bailey records the occurrence of *S. maritimus* in Queensland. **S. asper*, Hoffm. Grows to a large size in Campbell Creek, Melrose.

**Chrysanthemum coronarium*, L. As a garden escape at Berri.

Xanthium orientale*, L., ann. 1763 (*X. canadense*, Mill, ann. 1768). Sent to the Department of Agriculture from the neighbourhood of Renmark, and apparently numerous. This weed is a congener of the Bathurst Bur (X. spinosum*, L.), but has burs twice as large, with stouter and longer spines and two large divergent beaks at the summit of the bur. This is its first record in South Australia and it is a most undesirable introduction. The body of the bur is 14-18 mm. long and with the two beaks it measures 17-25 mm. in length. Originally an American species, but may have reached South Australia from the Mediterranean, as it approaches closely to the descriptions of *X. italicum*, Mor., the name given to a form of *X. orientale* naturalized in Mediterranean countries.

DESCRIPTION OF PLATES.

Plate V.

Triodia lanata, n. sp. 1, flowering glume. 2, palea. 3, pistil, stamens, and lodicules.

Plate VI.

Trichinium seminudum, n. sp. 1, perianth. 2, inner segment of perianth. 3, bract. 4, bracteole. 5, pistil and stamens.

Plate VII.

Poranthera triandra, n. sp. 1, male flower. 2, female flower. 3, female flower viewed from above after the fruit has fallen, showing the 3 calyx-segments and the hypogynous disk. 4, female flower and pedicel (fruit fallen). 5, embryo. 6, stamen.

Cratystylis conocephala, S. Moore. 1, female flower. 2, bisexual (or male ?) flower. 3, free, barren stamen of female flower. 4, summit of style.

Tillaea. 1, flower of *T. Sieberiana*, Schult. 2, carpel of same. 3, carpel of *T. acuminata*, F. M. Reader. 4, flower of same.

Plate VIII.

Brachycome tesquorum, n. sp. 1, female flower. 2, bisexual flower. 3, outer involucral bract. 4, inner involucral bract. 5, achene.

Revision of the Genus Stigmodera, and Descriptions of some New Species of Buprestidae (Order Coleoptera).

By H. J. Carter, B.A., F.E.S.

[Read June 8, 1916.]

Plates IX. and X.

Stigmodera, Escholtz.

More than most Australian families of the *Coleoptera*, the *Buprestidae* are in great need of revision; while of the *Buprestidae* the purely Australian genus, *Stigmodera*—numbering above 300 species of the most beautiful of our *Coleoptera*—has never been tabulated. There is, in consequence, much confusion arising from misidentification, synonymy, and *nomina nuda*. Twenty-three authors have described or named species, of whom, fortunately, the earlier writers—*e.g.*, Donovan, Kirby, and Castelnau and Gory—gave excellent figures, the monograph of the last two authors being a standard work of great value. Amongst later writers, Saunders gave figures not only of his own species, but of species of other authors identified by him. There is thus little difficulty in determining the majority of the species described by these authors. It is much to be regretted that later writers who have contributed most new names—*e.g.*, Thomson, Macleay, Blackburn, and Kerremans—have not published figures of their species, so that, where the types are not available for examination, there is some difficulty in determining the value of their species, unless they possess strongly differentiated characters. The work of Thomson is so casual, brief, and unscientific that the greater part is of little value. He seems to have taken little pains to acquire knowledge of the works of other authors on the subject. In consequence, as Kerremans has shown, a large number of his names are synonyms. Macleay's types are distributed between the Australian and the Macleay Museums in Sydney. I have been able to examine these. Moreover, many of the species described by Saunders were sent to him by Mr. G. Masters, late curator of the Macleay Museum, so that the named specimens in that Museum may in many cases be considered as co-types. Blackburn described fifty-five species, but with a tendency to insufficient allowance for variation, and sometimes with insufficient material. I find that no less than

seventeen of these must be considered as synonyms, or, at most, variations of previously-described species. Some of these have been indicated by himself, others were unfortunately published in papers which nearly synchronized with those by M. Kerremans, so that each of these writers sometimes repeated the work of the other. By the courtesy of Mr. Edgar R. Waite, of the South Australian Museum, and the co-operation of my friend, Mr. A. M. Lea, I have had the loan of a large number of specimens, including many of Blackburn's co-types, or specimens bearing labels in Blackburn's handwriting. This has been supplemented by similar help from Mr. Kershaw, of the National Museum, Melbourne, so that I have been able to determine with accuracy almost all the species named by this diligent entomologist. Further, a notebook containing the late Canon Blackburn's copious notes on various *Coleoptera* has been entrusted to me, in which is an outline of a tabulation of the genus *Stigmodera*. While not following the same method in my own tabulation, this has been of use in a few cases of species unknown to me. Besides the material mentioned above, all the unnamed or doubtfully-named specimens in the Macleay Museum, the Brisbane Museum, the Perth and Tasmanian Museums have been sent to me, together with the fine private collection of Mr. Lea. My own collection—largely taken by myself in twenty years' collecting in every Australian State, except South Australia, is a good one—and I am further indebted for specimens to Mr. C. French, Mr. H. W. Brown (the widest of our field collectors), and Mr. H. Hacker. In 1907 I visited the Museums of Brussels, Paris, and England, taking notes on specimens, especially in the Hope Museum, Oxford, and the British Museum (which last had recently purchased the fine collection of M. Kerremans), and I was thus able to compare specimens with many types. With this material I have ventured on a task that would otherwise have been insuperable, in the hope that the tabulation may render identification easier to collectors, and at the same time purge our catalogues of useless names. Probably some errors will occur, but at least this tabulation will afford a basis for future workers. Lastly, I would pay my homage to the great specialist in *Buprestidae*, M. Chas. Kerremans, whose cheery acquaintance I had the honour to make in 1907 and whose correspondence I have valued since. His standard work in the "Genera Insectorum" has been of great assistance to me, and I have, in part, followed his subdivision of the genus into the three subgenera mentioned below. Whatever be the value of these subdivisions zoologically, they are very helpful in classifying so large a genus. I had hoped to see the

completion of M. Kerreman's monumental monograph on the *Buprestidae* before attempting my tabulation, a work courageously continued throughout periods of ill-health. To this misfortune has now been added the martyrdom of his devoted country and the detestable German occupation, during which all correspondence has been impossible. I am sure that M. Kerremans will take an honest criticism in a generous spirit. Up to 1902 this author described some eighty-four Australian species of *Stigmodera*, of which twenty are confessed synonyms, partly through the synchronism with Blackburn's publications. To these I have added others below, in some cases confirmed by notes lately taken at the British Museum by Dr. E. W. Ferguson. In a few cases species placed together in my tabulation may not be synonymous. It is not sometimes possible to determine species *by description only*, especially when the descriptions omit important characters or *no following note shows the distinction between a new species and its nearest allies*. This should always accompany a description in so large a genus. While a European naturalist has the advantage of access to types and copious literature to hand, he has not generally the field experience and constant communication with collectors to enable him to decide questions of variation and distribution. This fact further emboldens me to attempt the work that follows.

VARIATION.—The variations of *Stigmoderae* are often so wide that it is always a dangerous supposition that an insect that looks at first sight unlike anything described is a new species. At the same time, while certain species seem liable to variation, a large number are singularly constant in colouration, pattern, and structure. These variations may be classified under:—(1) Size, (2) colour, (3) structure, (4) sex.

(1) *Size.*—While the majority of species will be found of a certain average size, remarkable instances occur in exceptional cases of dwarf or abnormally large specimens. Thus in the common species, taken around Sydney, I have before me *macularia*, Don., varying from 33 × 15 mm. to 21 × 9 mm.; *variabilis*, Don., from 37 × 15 mm. to 20 × 8 mm.; *jacquinoti*, Boisd., from 30 × 14 mm. to 19 × 8 mm.; *cyanicollis*, Boisd., from 13 × 4½ mm. to 7½ × 2½ mm.

(2) *Colour.*—Here will be found the chief stumbling-block to the novice. Again it is the commoner and widely-distributed species which vary most. The well-named *variabilis*, Don., is a good example of this. Here the elytra may be a concolorous red or yellow, while the three dark fasciae and apical spot show every form of interruption or absence. The following are some of the species in which a similar variation has been noticed:—*mitchelli*, Hope (with

its many-named variations, *infra*); *yarelli*, C. and G.; *semicincta*, C. and G. (with variety *variopicta*, Thoms.); *undulata*, Don.; *robusta*, Saund.; *ignota*, Saund.; *speciosa*, Kerr.; *dulcis*, Blackb.; *octospilota*, C. and G.; *punctiventris*, Saund.; *simulata*, C. and G.; *reichei*, C. and G.; *oleata*, Blackb.; *alexandri*, n. sp.; *regia*, Blackb. The presence or absence of shoulder spots is variable in *jekellii*, Saund.; *ignota*, Saund.; *skusei*, Blackb.; *punctiventris*, Saund.; and others. The absence or presence of yellow or red margin of the pronotum in the same species is rare, but nevertheless it seems to occur—*i.e.*, if *stevensi*, Gehin. = *tibialis*, Waterh., the latter being generally without such a margin: but I am very doubtful of this synonymy. The width of this pale margin in species with a dark disc and wide margins is very variable—*e.g.*, *thoracica*, Saund.; *latithoracæ*, Thom.; *vitticollis*, Macl.; *pictipes*, Blackb.; *tricolorata*, Waterh.; while some species vary in the amount of red colouration which takes the place of the usual metallic surface of the pronotum, as in *parryi*, Hope; *caroli*, Blackb. *Maculiventris*, Macl., is extremely variable in pattern; the type has the elytra orange-yellow, sanguineous towards apex, with a spot on the suture behind the scutellum, a postmedial fascia, and an apical patch dark-green; but the postscutellary spot is sometimes widened into a short fascia, there is often a wide preapical spot, sometimes shortly fasciate, while the suture is more or less widely dark. It is one of the largest of the subdivision *Castiarina*, having simple tarsal claws, and is wrongly placed with *Themognatha* in the "Genera Insectorum." The colour of the abdomen is variable, probably sexual, sometimes brassy-green with yellow spots at the sides; in other examples the abdomen is almost wholly yellow, the margins of segments only being green. The apex has a fringe of long yellow hair.

Melanism is of rare occurrence in the genus, but I have seen the variety of *variabilis*, Don., with the whole upper-surface black, except the yellow band to the prothorax, known as *nigripennis*, C. and G. What is more common is a tendency for the colour of the fasciae (in fasciated species) to spread more or less, sometimes wholly, over the surface of the elytra. Thus *cruentata*, Kirby, is an evident variety of *vegeta*, Hope. There is a wholly-blue specimen of *yarelli*, C. and G., in the Macleay Museum, and Mr. H. W. Brown has two beautiful blue-green specimens of *conspicillata*, White, while there is a well-known variety of *cyanicollis*, Boisd., found in Victoria and Tasmania, which I believe is the species described as *viridis*, C. and G. It is possible that the charming little species described *infra* as *leai* may be another local variety of

this, but it should be named. Blackburn mentions an example of *undulata*, Don., illustrating the above tendency (*ante*, 1897, p. 32).

It is thus quite possible that *varicollis*, Cart., is a variety of *yarelli*, C. and G., though this appears to be a good example of geographical variation, in which every specimen has a more or less constant pattern that varies from the type found elsewhere. This remark is also true of *rufipes*, Macl., a red-legged North Queensland form of *octospilota*, C. and G. This kind of variation, or species in the making, obviously intensifies the difficulty of sharp definition in the tabulation in a genus in which colour is so prominent a feature. In a few species the colour of the underside is variable. This will be treated especially under sex variation, but in the much-described *punctiventris*, Saund. (= *binotata*, Saund. = *guttata*, Blackb., etc.) the underside is either yellow or coppery, while in species having more or less yellow on the under-surface the amount of such colouration is very variable. *S. decipiens*, Westw., is also variable in pattern.

(3) *Structural variation* (including sculpture and clothing).—The chief variations here will be noted under sexual variation; otherwise such variations are rare, and the best diagnosis of species can be made on structural characters. There are, however, two obvious cases that deserve mention.

(a) Width, or expansion of the sides of prothorax.

(b) Structure of the apices of the elytra.

In a few cases there are some considerable variations under *(a)*—*e.g.*, *klugi*, C. and G., often shows wide differences in the form of the prothorax (a fact to which Mr. G. S. Bryant called my attention when collecting in Sydney). This is true also of the species *parryi*, Hope, which in a long series I cannot distinguish from *parvicollis*, Saund. *(b)* The apices of the elytra form, in general, one of the best characters for the separation of allied species, and some authors believe this to be a constant character in the same species. There is, however, sufficient variation here to give cause for trouble (*vide* Blackburn, *ante*, 1900, p. 48, on *yarelli*). The examination of long series of *bicincta*, Boisd.; *octospilota*, C. and G.; *cupricollis*, Saund., and others, will show enough variation to make exact description difficult, the spines sometimes being subobsolete; where the type has distinct spines. Also many of the larger species, whose apex is more or less truncate with a short external spine (*e.g.*, *thoracica*, Hope; *variabilis*, Don.) show a variation towards the simply-rounded apex.

(4) *Sexual variation*.—The most marked sexual distinction lies in the form of the last abdominal segment, the male having this segment more or less excised (*e.g.*, *reichei*, C. and

G.), or merely truncate (*e.g.*, *macularia*, Don.), while that of the female is rounded. The male is generally smaller (markedly so in *imperialis*, n. sp.), narrower, and more attenuated behind. In some species (*e.g.*, *chevrolati*, Gehin.; *reichei*, C. and G.) the female has a finely-forked ovipositor, to be found in many others only by dissection. I have not observed the sexual variation in density of punctures, noted by Blackburn, except perhaps in *pubicollis*, Waterh., in which the male has the thorax densely clothed with long hairs, the female having only a slightly pubescent surface. In such cases the density of hair is accompanied by a corresponding coarseness of sculpture. A more obvious sexual variation occurs in a few species in the colour of the abdomen. Thus in *alternata*, Lumh., the largest and most beautiful of the section *Castiarina*, the male has a yellow abdomen, while that of the female is dark-green, with lateral yellow spots; similarly with *maculiventris*, Macl. In *jekelli*, Saund., and *cruenta*, C. and G., the male has a yellow, while the female has a dark metallic abdomen. In *immaculata*, Cart., the pronotum and whole underside of the male is bright metallic-green, the corresponding parts of the female being brilliant-golden-copper. In *imperialis*, n. sp., the male is not only much smaller than the female, but the elytra are without the fascia found in the female. In the nearly-related species, *duboulayi*, Saund., and *macfarlanei*, Waterh., the male has one fascia, the female two fasciae, besides the dark apex to the elytra. In *conspicillata*, White, the male has only the apex of a dark colour, while the female has two fasciae as well as the apex so coloured.

S. oleata, Blackb.—Mr. H. W. Brown has taken a long series of this fine species at Yalgoo, Western Australia, of which seven specimens are before me—two male, five female. The author evidently had some doubt as to the male specimen described by him being conspecific with the female by his note of interrogation affixed thereto. I have little doubt that the male so described is that of another species, while there is some doubt as to his diagnosis of the sex of the female specimen described. I therefore append notes on the colour markings of the specimens before me.

♂. *(a)* Head, legs, and underside blue-black, the last three segments of abdomen red with dark margins; prothorax orange-red with narrow basal margin dark; elytra blue-black with medial fascia expanded laterally and wide preapical fascia connected narrowly at sides with the former orange-red, also a few small orange spots near basal margin.

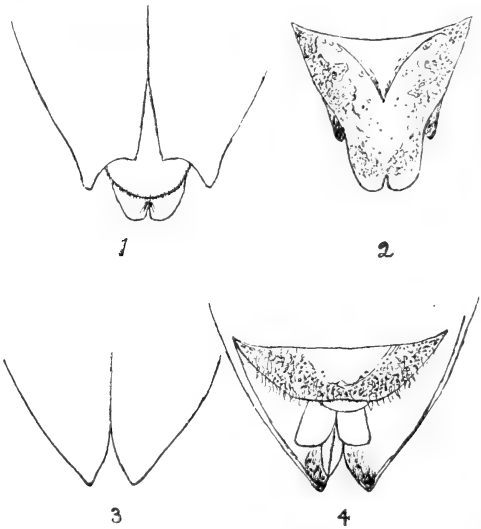
♂. *(b)* As in *(a)*, except prothorax with apical half suffused with darker markings, elytral orange fasciae not connected laterally, abdomen entirely dark (metallic blue and green).

♀. *(a)* Two specimens as in the description of the male by Blackburn (the whole blue-black, elytra with red preapical fascia).

♀. *(b)* Two specimens have an additional medial fascia orange-red, narrower than in the male, and widely interrupted at the suture.

♀. *(c)* One specimen, elytra as in *(b)*, but the prothorax has a vague transverse red band near the base.

S. sanguinosa, Hope.—In this species there is a marked sexual dimorphism in the structure of the apices of the elytra and of the last segment of the abdomen. In the male the



Sexual Variation of Apices of Elytra and Abdomen of *Stigmodera sanguinosa*.

Fig. 1. Apex of elytra of female. Fig. 2. Apical segment of abdomen of female. Fig. 3. Apex of elytra of male. Fig. 4. Apical segment of abdomen and part of aedeagus of male.

elytra are prolonged considerably beyond the abdomen, while in the female the reverse is the case. The last abdominal segment in the latter is bilobed, while it is truncate in the male. The quite different structure of the apices of elytra,

simply pointed in the male, bidentate in the female, is very unusual. I do not know a similar case in the whole genus.

I have noted in the tabulation special cases of variation as they occurred, for convenience of reference.

Distribution.—While the genus is exclusively peculiar to Australia and adjacent islands, the species are extraordinarily freakish in their distribution. A few species are very widely scattered, almost over the whole continent, while the majority are found in a quite limited habitat. Of the larger species I know only one, *mitchelli*, Hope, that is found in every one of the States; while *macularia*, Don., *variabilis*, Don., occur over the whole of the eastern side of the continent. Of the smaller species, the following are known to me as occurring in every State:—*Amphichroa*, Boisd.; *burchelli*, C. and G.: *cyanicollis*, Boisd., and its varieties; *iospilota*, C. and G.; *8-spilota*, C. and G.; *10-maculata*, Kirby, and *rufipennis*, Kirby. The country extending from north-west Victoria to the extreme west of Western Australia can only be considered as one faunal area, and many of the Western Australian forms occur over a great part of this area. I have received specimens of *simulata*, C. and G.; *robusta*, Saund.; *jekelli*, Saund.; *sanguineolenta*, C. and G.; *pallidiventris*, C. and G., from widely-separated places in this great area, extending as it does over thirty degrees of longitude. Besides the above, there are a few species—*e.g.*, *undulata*, Don.; *bicincta*, Boisd.; *crenata*, Don.; *8-maculata*, Saund.—that occur over the whole of eastern Australia. A large number, possibly the greater number of species, are very local in their occurrence, and collectors will often speak of limited regions where one rare species is known only to be found. Thus *cydista*, Rainb., has only been found in a limited district near Sydney, while Mr. Brown's captures in the Cue district show species unknown elsewhere.

Synonymy.

I have placed *var.* only before those names which ought, in my opinion, to be retained for certain constant forms, sometimes peculiar to certain districts, and which may in some cases prove to be distinct species, but which differ from the typical form. Thus *S. rufipes*, Macl., is a Queensland variety of *octospilota*, C. and G., having red femora. Again, under that much-described species, *mitchelli*, Hope, besides the *faux pas* of M. Thomson, occur var. 1, *quadrispilota*, Saund. (a robust large form peculiar to Western Australia); var. 2, *tasmanica*, Kerr (a small Tasmanian form); var. 3, *karattae*, Blackb. (a variable form from Kangaroo Island, Victoria, and southern New South Wales, generally smaller and darker than the typical form).

I have placed under the tabulation all the synonyms known or considered as such by me; but in the list immediately following this are placed only such synonyms as have not been so far published.

THEMOGNATHA.

1. *parryi*, Hope (=*fusca*, Saund.=*parvicollis*, Saund.=*major*, Waterh.=*picea*, Kerr.).
2. *sanguineocincta*, Saund. (=*alcyone*, Thoms.=*coelestis*, Thoms.).
3. *sanguinipennis*, C. and G. (=*cincticollis*, Kerr.).
4. *excisicollis*, Macl. (=*addenda*, Thoms.=*sincera*, Kerr.).
5. *haematica*, Hope (=(?) *clara*, Kerr.).
6. *affinis*, Saund. (=*limbata*, C. and G.=*adelpha*, Thoms.).
7. *sanguinea*, Saund. (=*pictiventris*, Kerr.=*cyaniventris*, Kerr.=*avuncularis*, Thoms.).
8. *donovani*, C. and G. (=*jansoni*, Saund.).
9. *rectipennis*, Blackb. (=*apicerubra*, Kerr.).
10. *reichei*, C. and G. (=*funerea*, White=*marmorea*, Blackb.).
11. *vitticollis*, Macl. (=*delia*, Thoms.=*fallaciosa*, Kerr.).
12. *mitchelli*, Hope (=*stricklandi*, Hope=*daphnis*, Thoms.=*ostentatrix*, Thoms.=var. 1, *quadrispilota*, Saund.=var. 2, *tasmanica*, Kerr.=var. 3, *karattae*, Blackb.).
13. *yarelli*, C. and G. (=var. 1, *flavipennis*, Gehin.=var. 2, *elegans*, Gehin.=var. 3, *varicollis*, Cart.).
14. *flavicollis*, Saund. (=*S. unicincta*, Saund.).

CASTIARINA.

15. *impressicollis*, Macl. (=*costalis*, Saund.).
16. *moribunda*, Saund. (=(?) *dispar*, Blackb.).
17. *punctiventris*, Saund. (=*guttata*, Blackb.=var. *minor*, Blackb.=var. *ignea*, Blackb.).
18. *atronotata*, Waterh. (=*guttaticollis*, Blackb.=*consularis*, Kerr.).

    NOTE.—*minor*, Blackb., is wrongly placed under *guttaticollis* by Kerremans (Gen. Ins., p. 207).
19. *septemnotata*, n. nom. (=*septemmaculata*, Blackb.; the latter name is preoccupied by Mannerheim for a synonym of *spilota*, C. and G.).
20. *producta*, Saund. (=*acutipennis*, Thoms.=(?) var. *sulcicollis*, Kerr.).
21. *delta*, Thoms. (=(?) *deceptor*, Kerr.).
22. *lilliputana*, Thoms. (=*Neocuris mastersi*, Macl.=*ocularis*, Kerr.=(?) *dawsonensis*, Blackb.).

23. *semicincta*, C. and G. (=var. *variopicta*, Thoms.).
24. *laena*, Thoms. (=var. *electa*, Kerr.).
25. *versicolor*, C. and G. (=*decemguttata*, Gory.=*parva*, Saund.).
26. *decemmaculata*, Kirby (=*inaequalis*, Kerr.).
27. *picta*, C. and G. (=*purpurea*, Hope=var. *laetabilis*, Kerr.).
28. *pallidiventris*, C. and G. (=var. *cincta*, Blackb.=*rubrocincta*, Kerr, n. praeoc.).
29. *elderi*, Blackb. (=*rustica*, Kerr.=*diversa*, Kerr.).
30. *andersoni*, C. and G. (=var. *verax*, Kerr.).
31. *mastersi*, Macl. (=var. *deleta*, Kerr.).
32. *distincta*, Saund. (=*sternalis*, Blackb.=*deliciosa*, Kerr. =var. *baliola*, Kerr.=var. *inermis*, Kerr.).
33. *fulviventris*, Macl. (=*guttigera*, Blackb.).
34. *auricollis*, C. and G. (=*ochreiventris*, Saund.=*strigata*, Macl.).
35. *wilsoni*, Saund. (=var. *sigma*, Kerr.).
36. *confusa*, Waterh. (=*agrestis*, Kerr.).
37. *anchoralis*, C. and G. (=*arborifera*, Blackb.).
38. *simulata*, C. and G. (=*helenae*, Hope=var. *phryne*, Thoms.=var. *lais*, Thoms.=var. *triramosa*, Thoms. = *distinguenda*, Thoms. = *fraterna*, Kerr.).
39. *ignota*, Saund. (=var. *semisuturalis*, Saund.).
40. *abdominalis*, Saund. (= (?) var. *unica*, Kerr.).
41. *tricolor*, Kirby (=*curta*, Saund.=*opima*, Kerr.).
42. *humeralis*, Kerr (=*tillyardi*, Cart.).
43. *gibbicollis*, Saund. (=*fascigera*, Kerr.).
44. *cyanipes*, Saund. (=*armata*, Thoms.=*longula*, Blackb.).
45. *cupricollis*, Saund. (= *alterzona*, Thoms. = *deyrollei*, Thoms.=*julia*, Thoms.).
46. *trifasciata*, C. and G. (=*apicalis*, C. and G.=*tacita*, Kerr.).
47. *affabilis*, Kerr. (=*simplex*, Kerr.).
48. *vegeta*, Hope (= *coeruleiventris*, Saund. = *haroldi*, Saund.=*viridiventris*, Saund., var. *cruentata*, Kirby=*neologa*, Thoms.=(?) *coerulea*, Kerr.=*coelestis*, Kerr.=*stillata*, Blackb.).
49. *crenata*, Don. (=*kreffti*, Macl.=*variata*, Kerr.).
50. *rubriventris*, Blackb. (=*maculifer*, Kerr.).
51. *burchelli*, C. and G. (=*perplexa*, Hope=*languinosa*, Hope=*hostilis*, Blackb.).
52. *sagittaria*, C. and G. (=*gravis*, Har.=*obscuripennis*, Saund.).
53. *amphichroa*, Boisd. (=*sexspilota*, C. and G.=*sieboldi*, C. and G.=*cylindracea*. Saund.=*bucolica*, Kerr.).

54. *hopei*, Saund. (=*burchelli*, Hope=*placida*, Thoms.).
55. *punctatosulcata*, Saund (=*litigiosa*, Kerr.).
56. *obscura*, Saund. (=var. *transversipicta*, Thoms.).
57. *alternecosta*, Thoms. (=*alacris*, Kerr.=*quadrinotata*, Blackb.).
58. *scalaris*, Boisd. (=*cyanicollis*, Boisd.=*subtritasciata*, C. and G.=*media*, Hope=*crucigera*, C. and G.=*prudens*, Kerr.).
59. *flavovaria*, Saund. (=*flavopicta*, C. and G.=*timida*, Kerr.).
60. *violacea*, Macl. (=*cupreoflava*, Saund.=*equina*, Blackb.).
61. *puerilis*, Kerr. (=var. *atrocoerulea*, Kerr.).
62. *rotundata*, Saund. (=(?) var. *aenicornis*, Saund.).

NOTES ON SYNONYMY.

(1) I have examined a large number of specimens labelled *parryi*, Hope, and *parvicollis*, Saund., and have carefully compared them with descriptions. While extreme cases are very different in size, and vary as to the amount of dark colouration on the pronotum, I have not been able to draw any definite line between the two names. The other synonyms have been already noted by Kerremans.

(2) (3) (4) (6) (7) I see no reason for the various names under these to mark minute differences scarcely amounting to variation.

(5) The description of *clara*, Kerr., would exactly correspond to a specimen of *haematica*, Hope, in which the blue colour extended over the whole abdomen; I have seen examples in which this is very nearly the case, the amount of red or blue on the underside being very variable.

(8) *S. donovani*, C. and G.=*jansoni*, Saund. There can be little doubt of this from a study of the figures and descriptions.

(9) The description of *apicerubra*, Kerr., exactly corresponds with my co-type of *rectipennis*, Blackb.

(10) *S. reichei*, C. and G., is very variable. Blackburn himself thought that *marmorea* was a synonym.

(11) I cannot see anything in the description of *fallaciosa*, Kerr, to distinguish it from *vitticollis*, Macl., a common Northern and Central Australian species, subject to wide variation. Dr. E. W. Ferguson informs me that there is some confusion between the names *vitticollis*, Macl., and *sexmaculata*, Saund., in the Brit. Mus. Coll., but these are widely different species.

(12) *S. mitchelli*, Hope, shares with *variabilis*, Don., the distinction of being the most variable in a variable genus.

I have little doubt of the synonymy of the seven names.

(13) After my recent experiences in the examination of long series, I am compelled to include *varicollis*, Cart., as a variety of *yarelli*, C. and G., though the name should stand for this local form, of which Mr. Duboulay took a large number, all more or less marked as stated in its description.

(14) I agree with Blackburn that *unicincta* is the male, *flavicollis* the female, of the same species.

(15) Saunders' figure and description of *costalis* proclaim its identity with *impressicollis*, Macl., a fairly common Queensland insect.

(16) I am a little doubtful here. There is a slight colour difference, as the suture and apex of *moribunda* are said to be narrowly black, this marking being absent from *dispar*, Blackb. This variation is so common in analagous cases—*e.g.*, *rufipennis*, Kirby, that I think I am justified in giving this synonymy.

(17) I have seen many specimens which include all these names and which form continuous series.

(18) (25) (26) (27) (30) (32) (35) (41) (43) (46) (47) (55) (56) (60) In all these cases Dr. E. W. Ferguson has been kind enough to confirm my own impressions by an examination of types in the British Museum. As regards (32), I have previously published the synonymy of *sternalis*, Blackb., with *distincta*, Saund. Dr. Ferguson's note on *inermis*, Kerr., states:—"There were two spp. included under *inermis*, both marked types; one = *distincta*, Saund. = *deliciosa*, Kerr.; the other = *nova*, Kerr.; *baliola* seems little more than a colour variety of *distincta*, Saund., with broader bands and basal elytral border."

(20) I have followed Kerremans in placing *acutipennis*, Thoms. = *producta*, Saund., though the former name has been long given in Australia to the species described as *insignis*, Blackb.

(21) *S. delta*, Thoms (*vide* note in tabulation).

(22) I am only slightly in doubt as to the correct inclusion of *dawsonensis* in this; but there is only a slight colour difference, the addition of an apical spot on each elytron, and this variation is common in other species.

(23) *S. variopicta*, Thoms. This form is well known to collectors as a variety of *semicincta*, C. and G. I have taken the two forms in company frequently, at Medlow, Blue Mountains.

(24) *S. electa*, Kerr., cannot be more than a variety of *laena*, Thoms.

(28) See note in the tabulation.

(29) (31) From descriptions and examination of many specimens, including co-type of *elderi*, Blackb., and the type of *mastersi*, Macl.

(33) Co-type of *guttigera* compared with type of *fulviventris*, Macl.

(34) Type of *strigata*, Macl., compared with figures and descriptions of *auricollis* and *ochreiventris*.

(36) More than probable.

(37) A co-type of Blackburn's *arborifera* is identical with the very common Perth species, *anchoralis*.

(38) One of the most variable of the smaller species. Extreme forms are very different in pattern, but all have the same general colour scheme and robust obese form (*fraterna* was merely a name to supply the preoccupied *distinguenda*).

(39) *S. semisuturalis*, Saund., is a well-known varietal form of *ignota*, Saund., to collectors. I have taken them together in the Blue Mountains.

(40) *Vide* note in tabulation.

(42) I confess to a blunder here, due to my not having then seen M. Kerremans' fine work (Genera Insectorum.)

(43) M. Kerremans was mistaken in placing *gibbicollis*, Saund., as synonymous with *grata*, Saund. The species are quite distinct. This no doubt accounts for his redescription of *gibbicollis* as *fascigera*, Kerr.

(44) I have already published the synonymy of *longula*, Blackb., with *cyanipes*, Saund.; *armata*, Thoms., described as from Sydney, is no doubt the same species. It is rare in the Sydney district, though occurring at Ropes Creek and in the Blue Mountains.

(45) Slight colour varieties, chiefly in the prothorax and underside.

(48) *S. cruentata*, Kirby, is the oldest of the names, but the pattern of *vegeta*, Hope, is the common one. I am a little doubtful as to the identity of *coelestis* with the above; *stillata* was a name given by Blackburn for *coelestis*, Kerr., the latter name being preoccupied by Thomson. There is no reason for placing *stillata* as a synonym of *laena*, Thoms., as M. Kerremans has done (Genera Insectorum).

(50) *S. rubriventris*, Blackb., was described from Western Australia. There is a New South Wales species very near, if not identical with it, but generally larger. It is possible that this is the form described as *maculifer*, Kerr.

(51) *S. hostilis*, Blackb. I have examined a co-type of this in the South Australian Museum collection, labelled by Blackburn. The apex of one elytron is slightly malformed or damaged; the other apex is perfect and ordinarily bispinose. As this is the only or main distinction between this and

burchelli, I conclude that Blackburn was misled by the malformation.

(52) Is my conclusion from figures and descriptions.

(53) (54) Common species that include all the names noted.

(57) The synonymy of *alacris*, Kerr., with *alternecosta*, Thoms., has been published by M. Kerremans himself. A co-type of *quadrinotata*, Blackb., in the South Australian Museum shows the same insect. A species I often used to find near Cook River, Canterbury (near Sydney).

(58) The commonest insect of the whole genus, with a corresponding variation, which I believe includes the names given.

(59) (61) I feel sure of the synonymy, from descriptions.

(60) *S. equina*, Blackb. Type in National Museum, Melbourne, examined by me and found identical with type of *violacea*, Macl. The suggestion of mine that *cupreoflava*, Saund., was the same was confirmed by Dr. Ferguson.

In the following tabulation an asterisk (*) is placed against species unknown to me. This tabulation is put forward with some diffidence, and is probably not without error. The difficulties can be partly estimated by the following statement of the numbers of names so far catalogued:—

		No. of species in tabulation.	No. of names catalogued.
A.	*Stigmodera*	8	15
B.	*Themognatha*	69	121
C.	*Castiarina*	241	386
	Total	318	522

In other words that 204, out of 522 names, should be either sunk as synonyms or treated as variations; a formidable list with which to make oneself familiar. M. Kerremans gave 345 species in the Genera Insectorum, and I find that four species were then omitted—*viz.*, *subpura*, Blackb.; *tyrrhena*, Blackb.; *pallas*, Blackb.; and *erubescens*, Blackb. If my tabulation is correct there are thus 318 existing species, of which 31 are here described as new.

The species can be divided into subgenera as follows:—

1. Elytra pitted with large foveate punctures (also striate-punctate in *cancellata*, Don.)—A. STIGMODERA, Eschs.
2-4. Elytra striated or striate-punctate, the intervals sometimes costate.
3. Tarsal hooks lobed or toothed at the base -B. THEMOGNATHA, Sol.
4. Tarsal hooks simple—C. CASTIARINA, C. and G.

Subgenus A. Table of Stigmodera, elytra pitted.

1-9. Elytra without coloured fasciae.
2-6. Elytra yellow.
3. Elytral foveae small, more or less concolorous with elytra apex widely bidentate—*goryi*, C. & G.; *curtisi*, Hope.
4-6. Elytral foveae large and black.
5. Apex of each elytron simply rounded—*macularia*, Don.; *cicatricosa*, Dalm.
6. Apex of each elytron bispinose (with oblique excision)—*jacquinoti*, Boisd.
7. Elytra brown-red, foveae black, apex subtruncate—*porosa*, n. sp.
8. Elytra red, foveae green, apex dentate—*sanguinosa*, Hope.
9. Upper surface brilliant golden-green—*gratiosa*, Chev.; *smaragdinea*, Hope.
10-12. Elytra with coloured fasciae.
11. Thorax and underside brilliant coppery-green—*roei*, Saund,; *cancellata*, Boisd.; *vescoei*, Gehin.
12. Thorax and underside dull-blue or green—*cancellata*, Don.; *dejeani*, Hope; *dejeaniana*, Boisd.

Note.—The geographical distribution of the above is curious, the first four species being peculiar to the eastern side, the last four to the western side of Australia.

Subgenus B. Themognatha, elytra striate, tarsal hooks lobed or toothed at base.

1-3. Tibiae enlarged and toothed on the external border.
2. Prothorax with yellow margins, abdomen yellow—*duponti*, Boisd.; *stevensi*, Gehin.
3. Prothorax concolorous, abdomen bronze—*tibialis*, Waterh.
4-117. Tibiae normal.
5-71. Elytra without coloured fasciae.
6-23. Elytra entirely red or yellow.
7-15. Prothorax concolorous.
8-10. Prothorax red (sometimes with bronzy reflections).
9. Alternate intervals of elytra costate—*heros*, Gehin.
10. Intervals regularly convex—*parryi*, Hope; *fusca*, Saund.; *parvicollis*, Saund.; *major*, Waterh.; *picea*, Kerr.
11. Prothorax bronze—*chalcodera*, Thoms.
12-14. Prothorax brassy-green.
13. Abdomen chiefly yellow—*brucki*, Thoms.
14. Abdomen brassy-green—*sanguineocincta*, Saund.; *alcyone*, Thoms.; *coelestis*, Thoms.
15. Prothorax black—*aestimata*, Kerr.
16-23. Prothorax with red or yellow margins.
17-19. Disc of pronotum black.
18. Margins of pronotum red, underside blue—*sanguinipennis*, C. and G.; *cincticollis*, Kerr.
19. Margins of pronotum yellow, underside black—*flavomarginata*, G. and H.; *cruentata*, Murray.
20-22. Prothorax green, with red margins.
21. Elytral apices simple—*menalcas*, Thoms.
22. Elytral apices strongly bispinose—*lobicollis*, Saund.

23. Prothorax red, with narrow central part black, abdomen red—*haematica*, Hope; (?) var. *clara*, Kerr.
24-53. Elytra red or yellow, suture or apex, or both with dark markings.
25-33. Prothorax concolorous.
26-28. Pronotum and underside blue.
27. Suture and sides generally with wide blue vittae—*suturalis*, Don.; *vertebralis*, Boisd.
28. Suture (partly) and apex only dark—*franca*, n. sp.
29-33. Pronotum and underside green.
30-32. Apices of elytra truncate.
31. Base, suture, and apex of elytra blue (apical mark *rarely* absent)—*similis*, Saund.
*32. Base and suture of elytra green, size smaller than *similis* *marcida*, Blackb.
33. Apices of elytra strongly bispinose—*excisicollis*, Macl.; *addenda*, Thoms.; *sincera*, Kerr.
34. Pronotum bronze (sometimes more or less red)—*caroli*, Blackb.; *capucina*, Blackb.
35-51. Prothorax with red or yellow margins.
36-38. Red margins as wide as or wider than discal colour.
37. Alternate intervals of elytra subcostate and narrowed—*latithorax*, Thoms.
38. Intervals of elytra uniform—*thoracica*, Saund.; *atalanta*, Thoms.
39-51. Margins of prothorax narrower than discal colour.
40-49. Disc of pronotum metallic-green, sides of elytra sanguineous.
41-43. Underside entirely green.
42. Sutural markings continuous from base to apex without notable enlargement—*limbata*, Don.
43. Sutural marking commencing behind base, with irregular widenings—*affinis*, Saund.; *limbata*, C. and G.; *adelpha*, Thoms.
44-48. Underside (in part at least) yellow.
45. Elytral suture green, abdomen with yellow spots, last segment with red bands—*sanguinea*, Saund.; *pictiventris*, Kerr.; var. *cyaniventris*, Kerr.; *avuncularis*, Thoms.
46-48. Apices of elytra strongly bispinose, margins of elytra not dark.
47. Sides of prothorax angularly widened, margins of pronotum and elytra red—*viridicincta*, Waterh.
48. Sides of prothorax rounded, their margins and elytra clear yellow—*donovani*, C. and G.; *jansoni*, Saund.
49. Apices of elytra truncate, margins of elytra blue-black—*lessoni*, C. and G.; *acutithorax*, Thoms.
50. Disc of pronotum and apical half of elytra coppery-red—*pascoei*, Saund.
51. Disc of pronotum and apex of elytra bronzy—*sanguiniventris*, Saund.
52. Disc of pronotum blue, margins irregularly red—*notaticollis*, n. sp.
*53. Disc of pronotum red, margins bronzy—*wimmerae*, Blackb.
54-62. Elytra brown, piceous, or black, lateral margins more or less yellow.
55-61. Prothorax with yellow or red margins.

56-58. Head and underside abnormally pilose.
57. Form oval, apices of elytra simple, pronotum strongly pilose in male—*pubicollis*, Waterh.; *lateritia*, Thoms.
58. Form navicular, apices strongly bispinose, pronotum not pilose—*barbiventris*, n. sp.
59-62. Head and underside normally pubescent.
60. Elytra reddish-brown, disc of pronotum black—*flavocincta*, C. and G.
61. Elytra brownish-black, disc of pronotum bronze—*grandis*, Don.
62. Pronotum mottled red and black, not margined—*gigas*, n. sp.
63-71. Elytra dark-blue or black, apex sanguineous (except in 71).
64-68. Prothorax concolorous.
65. Elytra (except apex) and underside black—*princeps*, Blackb.
66-68. Elytra (except apex) blue (or greenish).
67. Form elongate, apex widely red—*bonvouloiri*, Saund.
68. Form shortly ovate, apex narrowly red—*obscuripennis*, Mannerh.; *rugosipennis*, Thoms.
69-71. Prothorax margined more or less red.
70. Elytra blue, apex red, apical segments of abdomen red—*rectipennis*, Blackb.; *apicerubra*, Kerr.
71. Apex of elytra concolorous with rest, margins interruptedly red—*rufocyanea*, n. sp.
72-117. Elytra (in general) fasciated.
73-82. Prothorax concolorous (at least with no defined yellow or red margins).
74. Upper-surface nitid dark-green, underside black, elytra with a single preapical fascia red—*mniszechi*, Saund.
75. Whole surface brilliant-green, elytra with basal and preapical fascia yellow—*saundersi*, Waterh.; *obesissima*, Thoms.
76-80. Pronotum bronze or coppery.
77. Underside black, elytra black with irregular fasciae yellow—*reichei*, C. and G.; *funerea*, White; *marmorea*, Blackb.
78-82. Underside (or at least the abdomen) yellow.
79. Elytra with 3 black fasciae, apex sanguineous (pronotum sometimes with irregular orange spots near margin)—*murrayi*, G. and H.; *trifasciata*, Murray; *imperatrix*, Thoms.
80. Elytra with 2 fasciae and apex blue-black, underside blue—*spencei*, C. and G.; *egregia*, Boh.; *sternoceroides*, Thoms.
81. Pronotum blue, elytra with 3 fasciae and apex blue—*congener*, Saund.
82. Pronotum green, irregularly mottled yellow, elytra with one fascia and apex violet—*chevrolati*, Gehin.; *imperatrix*, White; *imperator*, Thoms.
83-85. Pronotum yellow (sometimes with dark discal markings), abdomen more or less yellow.
*84. Elytra with one fascia, shoulder, and subapical spot black, apices hooked—*martini*, Saund.
85. Elytra with one fascia and subapical spot blue, apex rounded—*flavicollis*, Saund.; *unicincta*, Saund.

86. Pronotum red with base, apex, and discal spot green, elytra with short fascia and apex green—*carpentariae*, Blackb.
87. Pronotum with sexual difference in colour, male orange, female blue-black (sometimes with red or orange basal band), underside black—*oleata*, Blackb.
88-113. Prothorax with yellow or red margins.
89-95. Yellow margins as wide or wider than dark disc.
90-94. Elytra with one fascia and apex blue.
91. Legs variegated, femora yellow, tibiae green—*pictipes*, Blackb.
92. Legs concolorous.
93. Whole abdomen yellow (24-29 mm. long)—*tricolorata*, Waterh.
94. Apical segments only yellow (36-42 mm. long)—*vitticollis*, Macl.; *delia*, Thoms.; *fallaciosa*, Kerr.
95. Elytra with basal margin and short fascia blue (male nonfasciate)—*imperialis*, n. sp.
96-113. Yellow or red margins of prothorax not as wide as dark disc.
97-99. Elytra with sexual colouration, male with one, female with two fasciae, and apex blue.
98. Disc of pronotum brilliant-copper, punctures small and sparse—*duboulayi*, Saund.
99. Disc of pronotum less nitid, punctures large and close—*macfarlani*, Waterh.
100-113. Elytra without sexual colouration.
101-108. Size large (more than 30 mm. long).
102-106. Disc of pronotum black (or nearly so).
103-105. Elytra with 3 yellow fasciae.
104. Elytra with preapical red spots, besides fasciae—*regia*, Blackb.
105. Elytra without preapical spots—*fortnumi*, Hope.
106. Elytra with 2 (widely interrupted) yellow fasciae—*sexmaculata*, Saund.
107. Disc of pronotum green, fasciae variable or absent—*variabilis*, Don.; *kingi*, W. S. Macl.; var. *nigripennis*, C. and G.; *unifasciata*, C. and G.
108. Disc of pronotum blue, elytra with 1 fascia and apex blue—*westwoodi*, Saund.
109-113. Size smaller (less than 20 mm. long).
110-112. Dark colour predominating on elytra.
111. Pronotum obscure green or blue, coarsely punctate—*mitchelli*, Hope; *stricklandi*, Hope; *daphnis*, Thoms.; *ostentatrix*, Thoms.; var. 1, *quadrispilota*, Saund.; var. 2, *tasmanica*, Kerr.; var. 3, *karattae*, Blackb.
112. Pronotum brilliant-green, sublaevigate—*laevicollis*, Saund.
113. Yellow colour predominating on elytra, pronotum blue, elytra with 3 fasciae, and apex blue—*yarelli*, C. and G.; var. 1, *flavipennis*, Gehin.; var. 2, *elegans*, Gehin.; var. 3, *varicollis*, Cart.
114-117. Margins of pronotum with one or more yellow blotches.
115. Size very large (42 mm. long), pronotal blotch near hind angles—*gloriosa*, n. sp.
116. Size smaller (28-32 mm. long), pronotal blotch obliquely invading disc; male apex only violet, female with 2 fasciae and apex violet—*conspicillata*, White; *signaticollis*, Hope; *cyanura*, Hope.

117. Size 20-23 mm. long, pronotal spot not invading disc, elytra with postmedial fascia bilobed and subapical triangular spot extended to apex—*praecellens*, Kerr.; *frenchi*, Blackb. (var., without yellow spot on prothorax, ground-colour of elytra red).

NOTE.—A specimen of this beautiful and rare species was taken by me at Wangaratta, Victoria. Mr. W. Duboulay tells me that his father took it at Albury. A specimen sent me from Inverell, corresponding with two in the Macleay Museum (from Murrurundie, New South Wales, and Ipswich, Queensland, respectively), is very similar in structure and pattern, but has a darker elytra and is without any yellow on the border or underside of prothorax. At present I hesitate to call this other than a variety of *praecellens*.

SUBGENUS C. CASTIARINA, elytra striate-punctate, tarsal hooks simple.

1-15. Elytra carinate-costate.

NOTE.—Only species with strongly-pronounced costae are included here. Many other species have less pronounced costae, *e.g.*, *costata*, Saund.; *lutei-pennis*, C. and G.; *nanula*, Kerr.

2-14. Elytra mostly red or yellow.

3-5. Form shortly ovate, suture, apex, or subapical spot black.

4. Pronotum very convex, dull-black, with deep medial line—*erythroptera*, Boisd.

5. Pronotum not very convex, nitid-purple or bronze, without medial line—*acuticollis*, n. sp.

6-8. Form long and narrow, elytra without dark markings.

7. Pronotum bronze with 4 deep foveate depressions—*impressicollis*, Macl.; *costalis*, Saund.

8. Pronotum purplish-green with 2 slighter lateral depressions—*attenuata*, n. sp.

9-11. Form widely oblong, pronotum bronze with deep irregular foveate depressions.

10. Elytra red, suture and apex black, apices trispinose—*nasuta*, Saund.

11. Elytra with carinae red, interstices black, apices finely bispinose—*spinolae*, C. and G.

12. Pronotum and elytra testaceous—*testacea*, Saund.

13-15. Pronotum yellow with black vitta or vittae.

14. Elytra orange with blue-black spots—*decipiens*, Westw.; *capucina*, Thoms.; *tricarinata*, Macl.

15. Elytra blue-black, pronotum trivittate—*octocostata*, n. sp.

16-423. Elytra without carinate costae.

17-24. Elytra yellow (without dark markings except basal margins).

18-21. Pronotum and underside metallic-green, more or less rounded on sides.

19. Elytral intervals flat, 13 mm. long—*planata*, n. sp.

20. Elytral intervals convex, 9½ mm. long—*moribunda*, Saund. (sometimes with suture and apex narrowly cyaneous—(?) *dispar*, Blackb.

21. Alternate intervals subcostate, apex sanguineous, 7-8 mm. long—*tincticauda*, n. sp.
22. Prothorax straightly narrowed from base to apex, with sexual colouration—*immaculata*, Cart.
23. Prothorax dark-bronze green or coppery, abdomen yellow—*pallidipennis*, Blackb.; *addenda*, Kerr.
24. Whole surface above and below yellow—*flava*, Saund.; *flavescens*, Thoms.; *flavidula*, Kerr.
25-62. Elytra yellow or red with suture or apex, or both, dark.
26-60. Prothorax concolorous.
27-37. Pronotum, apex, and suture (except in *canaliculata*, Blackb.) of elytra black.
28-36. Abdomen cyaneous.
29-35. Form elongate-oblong, prothorax not widest at base.
30. Male with apex of abdomen produced and bilobed, prothorax very wide—*rufipennis*, Kirby; var. *crocipennis*, C. and G.
31-35. Male with apex of abdomen normal (excised or truncate).
32. 13 mm. long, elytra red, sides of prothorax evenly rounded—*parallela*, Saund.; *crocipennis*, Hope.
33-35. 6 mm. long, elytra testaceous, sides of prothorax widely rounded.
34. Apex of elytra wholly black—*nanula*, Kerr.
*35. Black suture not extending to apex—*canaliculata*, Blackb.
36. Form widely ovate, prothorax widest at base—*amplipennis*, Saund.
37. Abdomen flavous—*rubricauda*, Saund.
38-40. Pronotum bronze, underside blue or violaceous.
39. Suture of elytra only black (this enlarged and terminated before apex; elytra sometimes concolorous yellow)—*subpura*, Blackb.
40. Apex narrowly, and short subapical fascia black—*balteata*, Saund.; *postica*, Thoms.
41-45. Pronotum coppery or greenish-bronze.
42. Sutural colour widely dark blue-green—*elongata*, Saund.
43-45. Sutural colour narrowly green or bronze.
44. Abdomen green—*observans*, Kerr.
45. Abdomen golden-bronze or yellow—*bimaculata*, Saund.; *punctiventris*, Saund.; *guttata*, Blackb.; var. 1, *minor*, Blackb.; var. 2, *ignea*, Blackb.
46-59. Base and apex of elytra only dark, 16 mm. long or less.
47-49. Apex of elytra widely black, apices bidentate.
48. Pronotum and abdomen black—*nigriventris*, Macl.
49. Pronotum coppery, abdomen green—*viridiventris*, Macl.
*50. Apex of elytra widely purple, pronotum bronze-green—*phaeorrhea*, Kirby.
51-59. Apex of elytra narrowly dark.
52-56. Abdomen golden, or golden-green.
53. Apices of elytra with long external spine, posterior margins serrate—*hirundicauda*, n. sp.
54. Apices of elytra rounded, margins entire.
55. Elytral intervals subdepressed, apex green—*jucunda*, Saund.
56. Elytral intervals subcostate, apex black (sometimes with postmedial spot)—*luteipennis*, C. and G.
57-59. Abdomen yellow, posterior margins of elytra serrate.

58. Pronotum green, apices of elytra unidentate—*cinnamomea*, Macl.
59. ([?] var. of 58). Pronotum reddish-bronze, apices of elytra finely bidentate—*straminea*, Macl.
60-62. Elytra with large preapical spot extending, or not, to apex, pronotum blue, 18-22 mm. long.
61. Apices of elytra strongly bispinose, slightly recurved—*hackeri*, Cart.; *caudata*, Cart.
62. Apices of elytra rounded—*unimaculata*, Cart.
63. Pronotum red with black spot on disc, apex of elytra with large black spot—*maculicollis*, n. sp.
64. Pronotum black with wide red margins—*analis*, Saund.
65-90. Elytra yellow or red with dark spots.
66-83. Pronotum concolorous.
67-73. Pronotum greenish-bronze, elytra without dark suture or apex.
68-70. Elytra with 7 blue spots, underside blue.
69. One spot only on suture, normally pubescent beneath—*spilota*, C. and G.; *septemmaculata*, Mannerh.
70. Three spots on suture, densely pubescent beneath—*septemnotata*, n. nom.; *septemmaculata*, Blackb.
71. Elytra with 7 green spots, underside bright-green, pronotum transverse—*septemguttata*, Waterh.
72. Elytra with 8 blue spots, underside bronze—*octomaculata*, Saund.
73. Elytra with 5 black spots behind the middle—*quinquepunctata*, Waterh.
74-82. Apex of elytra black (or nearly so).
75. Pronotum black, elytra red with large medial spot—*maculipennis*, Saund.
76-82. Pronotum and underside green.
*77. 21 mm. long, elytra with 6 spots and apical margin black—*punctatostriata*, Saund.
78. 15 mm. long, elytra red with 2 large discal spots—*binotata*, Saund.
*79. 10 mm. long, elytra with 4 spots, scutellary region and apex dark—*scutellaris*, Kerr.
80-83. 7½-8 mm. long, elytra testaceous with dark spots.
81. Elytra with 3 black spots near apex—*triguttata*, Macl.
82. Elytra with suture, apex, sutural, and 4 lateral spots green—*sexguttata*, Macl.; spots variable or absent—var. *puella*, Saund.
83. Pronotum brassy-black, elytra with 4 lateral black spots—*quadriguttata*, Macl.
84-88. Pronotum red with dark discal markings.
85-87. Apex of elytra dark.
86. Pronotum with 2 green vittae, sometimes connected—*mustelamajor*, Thoms.; *gibbosa*, Macl.
87. Pronotum with large central transverse mark—*atronotata*, Waterh.; *guttaticollis*, Blackb.; *consularis*, Kerr.
88. Pronotum with central spade-shaped mark, apex of elytra reddish—*sexnotata*, n. sp.
89. Pronotum yellow, with oval black spot at centre of base—*trimaculata*, Saund.
90. Pronotum golden-green, margins yellow—*septemspilota*, Cart.
91-111. Elytra dark with yellow or red spots, pronotum and underside coppery or green.

92-95. Pronotum medially sulcate, apices of elytra close and subunidentate.

93. Each elytron with 3 round spots, basal and preapical connected with red marginal marks—*producta*, Saund.; *acutipennis*, Thoms.; (?) var. *sulcicollis*, Kerr.

94. Each elytron with lateral and discal spot yellow, preapical subfasciate spot yellow and red—*venusta*, Cart.; *suavis*, Cart.

95. Each elytron with subhumeral and 3 discal spots yellow, hindmost connected with red lateral spot—*gentilis*, Kerr.

96-106. Pronotum not medially sulcate.

97-99. Apices of elytra widely divergent, each strongly bispinose.

98. Basal third of elytra dark—*insignis*, Blackb.

99. Basal third of elytra yellow—*caudata*, Kerr.

100-102. Apices of elytra strongly acuminate (more so than in *producta*), subapical spots linear.

101. Subapical spots diverging towards apex (14 mm. long)—*acuminata*, Kerr.

102. Subapical spots converging towards apex (7-9 mm. long)—*obliqua*, Kerr.

103. Apices less acuminate than in *producta*, form more parallel—*delta*, Thoms.; (?) *deceptor*, Kerr.

104-111. Apices bispinose, interior spine small.

105. Each elytron with 3 discal spots, hindmost red at side—*delicatula*, Kerr.

106. Each elytron with humeral and 3 discal spots, hindmost at sides and margins red—*spectabilis*, Kerr.

107-111. Elytra without red markings.

108. Each elytron with 1 lateral and 2 discal spots yellow (10-12 mm. long)—*confinis*, Kerr.

109-111. Size small (7-8 mm. long), prothorax bulbous.

110. Each elytron with lateral and 2 discal spots and preapical fascia yellow—*pulchella*, n. sp.

111. Elytral spots smaller and without preapical fascia—*lilliputana*, Thoms.; *ocularis*, Kerr.; *(Neocuris) mastersi*, Macl.; (?) var. with 2 additional yellow spots at apex, (?) *dawsonensis*, Blackb.

NOTE. — *Gentilis*, *pulchella*, and *lilliputana* might well be placed in a separate group, form elongate-ovate, apex not acuminate. There is an unaccountable mistake in Ann. Soc., Belg., 1900, p. 312, where M. Kerremans places *delta*, Thoms., as a synonym of *punctatostriata*, Saund. A glance at the description and figure of the latter shows a widely different insect, besides the difference in dimensions (*delta*, 12×4 mm.; *punctatostriata*, 21×8 mm.). From description I think *delta*, Thoms. = *deceptor*, Kerr.

S. libens, Kerr., is omitted from the tabulation as unknown to me, while the description as to structural characters is too brief for accurate diagnosis. It is apparently near *delicatula*, Kerr.

112-134. Elytra almost wholly dark with longitudinal or transverse yellow or red markings.

113-117. Size large, 18-21 mm. long.

114. Elytra brown-black, margins yellow, apices bispinose—*semicincta*, C. and G.; var. *variopicta*, Thoms.

115. Elytra purple with straight vitta and preapical transverse yellow, apices truncate—*jubata*, Blackb.
116. Elytra violet-purple, with a medial fascia golden—*magnifica*, Blackb.
*117. Elytra blue, pronotum golden-red, the first with humeral spot and antemedial fascia yellow—*chobauti*, Thery.
118-134. Size smaller, 15 mm. long or less.
119-130. Elytra mostly green (sometimes blue in *leai*).
120-124. Elytra olive-green, abdomen yellow.
121-123. Pronotum yellow with discal and basal spots black.
122. Elytra with subapical fascia and epipleural spot yellow—*pertyi*, C. and G.; var. *mima*, Saund.
123. Elytra with 2 fasciae, margins and humeral spot yellow—*flavosignata*, Macl.
124. Pronotum brassy-green—*luteocincta*, Saund.
125-130. Whole surface mostly (including abdomen) metallic-green.
126. Elytra with anterior sides and wide preapical band orange-red—*kerremansi*, Blackb.; *apicalis*, Kerr.
127. Elytra with narrow shoulder and wide preapical mark yellow, the latter with 2 green spots—*ocelligera*, C. and G.
128. Elytra with margins and variable number of elongate discal spots yellow—*virginea*, Erich.
129. Elytra with margins only in part yellow—*viridis*, C. and G. (possibly a local Victorian and Tasmanian variety of *cyanicollis*, Boisd.).
130. Elytra with epipleural spot and apical fascia yellow—*leai*, n. sp. (possibly a variety of 129).
131-133. Whole surface blue, or blue-black, with pale elytral markings.
132. Widely ovate, elytra with wide yellow medial band—*obsepta*, Kerr.
133. Elongate, elytra with humeral margins and preapical band red—*dulcis*, Blackb.; *colorata*, Kerr.
NOTE.—Very variable, often approaching *thomsoni*, Saund., of which it is a possible Tasmanian variety
134. Black, basal third of elytra and first three segments of abdomen yellow—*seminigra*, Cart.
135-166. Elytra with pairs of yellow or red spots, the middle four tending to become interrupted fasciae.
136-154. Head without yellow spot, elytral apices simply or finely bidentate.
137-148. Elytra with epipleural and 8 discal spots yellow.
138-145. Prothorax concolorous.
139-144. Abdomen dark, form cylindric.
140-142. Elytra dark-blue or purple, underside densely pilose.
141. Margins of elytra yellow, discal spots subequal—*xanthopilosa*, Hope; *parallela*, White; *splendida*, Gehin.
142. Latero-humeral spot yellow, middle spots variable in size—*elongatula*, Macl.
143. Surface golden-green, 4 anterior spots elongate—*crocicolor*, C. and G.
144. Elytra blue, 4 elongate spots ante and 4 subfasciate postmedian spots red, form acuminate—*lepida*, n. sp.
145. Abdomen yellow, form oblong attenuate behind—*pictipennis*, Saund.
NOTE.—Four anterior yellow spots, sometimes coalescing, as in Saunders' figure.
146-148. Prothorax with yellow margins, 4 medial spots subfasciate.

147. Abdomen dark, elytral intervals nearly flat—*victoriensis*, Blackb.; *sensitiva*, Kerr.

148. Abdomen yellow, elytral alternate intervals subcostate—*costipennis*, Saund.

149-154. Elytra with marginal and 6 discal spots yellow, abdomen dark.

150-152. Prothorax concolorous.

151. Pronotum with medial sulcus—*mansueta*, Kerr.

152. Pronotum without medial sulcus, prothorax globose—*laena*, Thoms.; var. *electa*, Kerr.

153. Prothorax and elytra with red margins, elytra with humeral and 2 basal spots and 2 fasciae yellow—*rufolimbata*, n. sp.

154. Prothorax purple with bright-green margins, elytra with 4 marginal and 6 discal spots yellow—*versicolor*, C. and G.; *decemguttata*, Gory; *parva*, Saund.

155-166. Head with yellow spot, prothorax with yellow or red margins, underside mostly yellow.

156-165. Apices of elytra trispinose, posterior margins entire.

157-161. Elytra with epipleural and 8 discal spots yellow.

158. Form ovate and obese—*octospilota*, C. and G.; *femorata*, C. and G.; *adelaidae*, Hope; (var.) *rufipes*, Macl.

159-164. Form parallel.

160. Basal spots more or less round—*decemmaculata*, Kirby; *inaequalis*, Kerr.

161. Basal spots elongate linear—*picta*, C. and G.; *purpurea*, Hope; var. *laetabilis*, Kerr.

162-166. Elytra with epipleural and 6 discal spots yellow or red, underside yellow.

163. Apex and margins of elytra red, apices bluntly tridentate—*pallidiventris*, C. and G.; var. *cincta*, Blackb.; *rubrocincta*, Kerr.

NOTE.—The only distinctions I can find between *cincta* and *pallidiventris* are the larger size and the antemedial dark fascia continuous to the sides in the former.

164. Apex of elytra dark, apices acutely trispinose—*elderi*, Blackb.; (margins of elytra sometimes reddish) *rustica*, Kerr; *diversa*, Kerr.

165. Form oblong-attenuate, elytra with large basal and apical spots and postmedial fascia brick-red, femora red—*argillacea*, n. sp.

166. Apices of elytra bispinose, posterior margins serrated—*serratipennis*, n. sp.

NOTE.—*Octospilota*, *elongatula*, *crocicolor*, and others of this group have a tendency to longitudinal confluence of the elytral yellow markings. Of *octospilota* there is a common variety from Perth, Western Australia, in which the basal and medial spots coalesce, also the postmedial and subapical, leaving the margins, suture, and one fascia dark. *Rufipes*, Macl., is a well-marked Queensland variety, with red femora and distinctions in the pattern. The name should be kept.

I have a specimen of *elongatula*, from Sydney, in which all the spots on each elytron have thus coalesced, so that the dark markings consist only of a marginal and a sutural vitta, thus approaching (but distinguished from) *vittata*, Saund.

167-171. Elytra with longitudinal dark vittae (sutural and two discal).
168-170. Prothorax concolorous.
169. Elytra yellow, unidentate, vittae continuous to apex—*vittata*, Saund.
170. Elytra red, bispinose, discal vittae not continuous to apex—*sanguinolenta*, C. and G.
171. Prothorax with margins widely red—*amabilis*, C. and G.
172-194. Elytra with basal margins, postmedial fascia, and apex only dark.
173. Posterior margins serrated, pronotum and underside blue, form elongate—*longicollis*, Saund.
174. Near preceding, but postmedial fascia with bilobed extension in front (sometimes forming a subbasal fascia), also suture blue—*desideria*, n. sp.
175-194. Posterior margins entire.
176-179. Size large, 20 mm. long or more.
177. Fascia and apical mark connected externally, latter with 2 yellow spots—*erubescens*, Blackb.
178. Space between fascia and apical mark dark-red—*alternata*, Lumh.
179. Apical half of elytra more or less red, markings variable *(vide supra)*—*maculiventris*, Macl.
180-193. Size medium (12-15 mm. long), elytral intervals flat or little raised.
181-187. Elytral apices strongly bispinose, truncate between spines.
182-185. Fascia narrow, elytra without red margins.
183-188. Form elongate.
184. Apical mark wide and square—*andersoni*, C. and G.; var. *verax*, Kerr.
185. Apical mark narrow—*mastersi*, Macl.; var. *deleta*, Kerr.
186-188. Fascia wider, elytra with red markings.
187. Space between fascia and apical mark red, underside blue-black—*brutella*, Thoms.; *terminalis*, Kerr.
188. Elytral apices narrowly bispinose, underside bronze-green (variety without fascia)—*uniformis*, Kerr.; (?) *graphisura*, Thoms.
189-194. Form ovate, elytral apices shortly bispinose.
190-192. Underside blue.
191. Antennae normal—*distincta*, Saund.; *sternalis*, Blackb.; *deliciosa*, Kerr.; var. *baliola*, Kerr.; var. *inermis*, Kerr.
192. Male with flabellate antennae—(Hypostigmodera) variegata*, Blackb.
193. Pronotum and underside golden-green, apex lunate—*nova*, Kerr.
194. Size small (7-5 mm. long), elytral intervals subconvex—*subcostata*, Kerr.
195-203. Elytra with basal margins, suture, one fascia and apex dark.
196. Prothorax red, with central vitta and 2 spots blue—*coccinata*, Hope; *elongatula*, White.
197-203. Prothorax concolorous and dark.
198. Size large, 20 mm. long or more—*sancta*, Cart.
199-203. Size smaller, 16 mm. long or less.
200-202. Apices of elytra bispinose.
201. Form oval, sutural band wide, fascial margins straight—*skusei*, Blackb.; *laudabilis*, Kerr.

202. Form navicular, sutural band narrow, fascial margins irregular—*campestris*, Blackb.
203. Apices of elytra trispinose—*pulchripes*, Blackb.
NOTE.—*Skusei* and *campestris* have sometimes a dark spot on shoulder.
204-228. Elytra with basal margin, humeral spot, one fascia, and apex (or subapical mark) dark.
205-210. Form cylindric, underside coppery-bronze, elytra with preapical mark dark.
206. Prothorax golden, centre of disc violet—*insignicollis*, Blackb.
207-225. Prothorax concolorous.
208-210. Elytra with spot on suture between fascia and scutellum.
209. Size larger (15 mm. long), elytral intervals strongly-punctate—*convexa*, Cart.
210. Size small (9 mm. long), elytral intervals finely punctate—*filiformis*, Blackb.
211. Form obovate and flat, elytra with suture dark near scutellum, apical margins red—*tyrrhena*, Blackb.
212-228. Apex of elytra dark.
213-215. Form narrowly navicular.
214. Elytral apices widely dark, basal sutures not dark, without red margins—*gracilior*, Cart.; *gracilis*, Cart.
215. Apical mark square, basal suture dark, subapical margins red—*disjecta*, Kerr.
216. Form shortly ovate (as in *mustelamajor*, Thoms.), subapical area red—*festiva*, n. sp.
217-225. Form elongate-ovate.
218-222. Elytra with dark spot on suture, between fascia and scutellum.
219. Abdomen blue—*propinqua*, n. sp.
220-222. Abdomen yellow or red.
221. Elytra with red margins, form subcylindric—*haswelli*, n. sp.
222. Elytra without red margins, form ovate—*fulviventris*, Macl.; *guttigera*, Blackb.
223-225. Elytra with suture dark throughout.
224. Abdomen dark-green, elytral markings green and violet—*macleayi*, Blackb.
225. Abdomen yellow, elytral markings bronze-green—*auricollis*, C. and G.; *ochreiventris*, Saund.; *strigata*, Macl.
226-228. Prothorax with yellow margins, elytra with dark humeral spot.
227. 14 mm. long, disc of pronotum and elytral suture black—*audax*, Saund.
228. 9 mm. long, disc of pronotum bright-bronze, suture not dark—*titania*, n. sp.
229-266. Elytra with basal margin, apex (or subapical mark), postmedial fascia, and humeral vitta dark.
230-259. Prothorax concolorous.
231-252. Underside dark.
232-236. Size large, 15 mm. long or more.
233-235. Elytra yellow with dark-green or blue markings, apex dark.
234. Prothorax widest at middle, apices of elytra simply rounded—*undulata*, Don.; *laportei*, Boh.

235. Prothorax widest at base, apices of elytra bispinose—*neglecta*, n. sp.
236. Elytra red with short subapical fascia—*indistincta*, Saund.
237-252. Size smaller, 12 mm. long or less.
238. Alternate intervals of elytra subcostate—*costata*, Saund.
239-252. All intervals uniform.
240-247. Apex of elytra widely dark, humeral vitta arcuate.
241-243. Elytral markings blue.
242. Pronotum and underside violet or coppery, form elongate and parallel—*wilsoni*, Saund.; var. *sigma*, Kerr.
243. Pronotum and underside peacock-blue, sides of elytra sinuate—*flavopicta*, Boisd.; *bicolor*, C. and G.; *colorata*, Hope.
244. Pronotum and underside metallic-green, elytral markings purple—*flavopurpurea*, Cart.
245-247. Pronotum coppery.
246. Underside coppery—*confusa*, Waterh.
*247. Underside blue black—*agrestis*, Kerr.
248-253. Apex of elytra very narrowly dark or pale with preapical marking.
249-251. Form convex and robust, preapical fascia anchor-shaped.
250. Pronotum and underside bronze-black—*anchoralis*, C. and G.; *arborifera*, Blackb.
251. Pronotum and underside coppery—*simulata*, C. and G.; *helenae*, Hope; var. *phryne*, Thoms.; var. *lais*, Thoms.; var. *triramosa*, Thoms.; *distinguenda*, Thoms.; *fraterna*, Kerr.
252. Form narrower and flatter, extreme apex narrowly green (rarely connected with preapical marking)—*iospilota*, C. and G.
253-259. Abdomen (at least apical segments) yellow.
254-258. Size large (15 mm. long or more), elytra red, preapical mark straight.
255-257. Apices of elytra finely but distinctly bispinose.
256. Pronotum irregularly and coarsely punctate—*speciosa*, Kerr.

NOTE.—In general with postmedian fascia; this, in type specimen, only represented by a spot on each side, not mentioned in the description.

257. Pronotum regularly and finely punctate—*ignota*, Saund.
258. Abdomen of male yellow, of female green, apices of elytra with minute excision not bispinose—*jekelli*, Saund.
259. Size smaller, elytra yellow, preapical mark cordate or sagittate—*abdominalis*, Saund.; (?) *unica*, Kerr.

NOTE.—*Unica*, Kerr., described as from Sydney. With a long experience amongst collectors in this district, the only species I know near it is *abdominalis*, Saund., and the author's description may well apply to a discoloured specimen of *abdominalis* in which the green markings appear black.

260-265. Prothorax with yellow or red margins.
261. Underside golden-green.
262-264. Preapical marking cordate or anchor-shaped.
263. 14-15 mm. long, sides of prothorax and ground of elytra orange-red—*cupida*, Kerr.
264. 10-12 mm. long, sides of prothorax (narrowly) and elytra yellow—*tricolor*, Kirby; *curta*, Saund.; *opima*, Kerr.

265. Wide dark apical mark surrounding 2 yellow spots—*humeralis*, Kerr.; *tillyardi*, Cart.

NOTE.—A Brisbane variety of this is without humeral vitta.

266. Underside yellow, head with yellow spot, apex and margins of elytra red—*flaviceps*, Cart.

267-281. Elytra with circum-scutellary patch, postmedial fascia and apex dark.

268-275. Prothorax concolorous.

269-271. Circum-scutellary patch large (extending over greater part of anterior third).

270. Size large (18 mm. long), pronotum and underside bronzy-black—*bremei*, Hope.

271. Size medium (13-16 mm. long), pronotum and underside golden-coppery—*ornata*, Blackb.

272-275. Circum-scutellary patch small.

*273. Elytral markings blue, intervals smooth, 13 mm. long—*cordifer*, Kerr.

274. Elytral markings green, intervals punctate, 9 mm. long—*doddi*, Cart.

275. Size small (6-7 mm. long), scutellary spot connected at base with shoulder spots—*hilaris*, Hope.

276-281. Prothorax with yellow or red margins.

277. Apices strongly bispinose, elytral intervals closely punctate—*biguttata*, Macl.; *terrae-reginae*, Blackb.; *triangulosa*, Kerr.

278. Apices lunate subbispinose, intervals smooth—*gibbicollis*, Saund.; *fascigera*, Kerr.

279-281. Apices of elytra simply rounded.

280. Scutellary patch not extending to sides at base, markings dark-green—*grata*, Saund.

281. Scutellary patch extending to sides at base, markings bright-green—*subgrata*, Blackb.; *campestris*, Kerr.

NOTE.—In the last two species—doubtfully distinct—the lateral half of each elytron is much more closely punctate than the sutural half.

282-306. Elytra dark with two yellow or red fasciae.

283-291. Medial pale fascia arcuate and interrupted at suture.

284-290. Size large (15-20 mm. long), posterior margins denticulate.

285-301. Prothorax concolorous.

286-289. Apices of elytra rounded, upper-surface mostly blue-black or blue.

287. Pronotum dark-bronze, underside blue (with or without yellow humeral spot)—*hoffmannseggi*, Hope.

288. Pronotum dark-violet, underside dark-green—*fairmairei*, Kerr.

289. Pronotum and underside coppery or golden—*pallas*, Blackb.

290. Apices feebly bidentate, whole surface (except fasciae) bright-blue (with or without yellow humeral spot, the latter form with prothorax much widened and elytra obovate)—*klugi*, C. and G.

291. Size smaller (10-14 mm. long), posterior margins entire, upper-surface bright-green, underside coppery-green with latero-subhumeral yellow spot—*dimidiata*, Cart.

NOTE.—This species is specifically near *cyanicollis*, Boisd.; *viridis*, C. and G.; and *leai*, Cart., but the exigencies of tabulation place it here.

292-306. Elytra black, blue-black, or violet-black, medial fascia nearly straight and continuous.

293. Apical margins of elytra red, pronotum black—*bella*, Saund.; *cruentata*, C. and G.

294-301. Pronotum bronze.

295-300. Elytra violaceous, intervals little raised.

296. Apices of elytra trispinose, underside blue—*bicincta*, Boisd.; *bicingulata*, C. and G.; *dejeani*, Gory; *trispinosa*, Kerr.

297-301. Apices bispinose.

298. Apical spines of equal length, underside bronzy, elytral intervals sublaevigate—*vicina*, Saund.; *bicincta*, C. and G.

299-301. External spine longer.

300. Underside purple, elytral intervals strongly punctate—*subbifasciata*, Saund.

301. Elytra blue-black, alternate intervals subcostate, underside green-bronze—*coeruleipes*, Saund.; variety with oval basal spots yellow—*montana*, n. var.

302-306. Prothorax with red or yellow margins.

303-305. Margins of prothorax widely and of abdomen red, the former subangulately widened.

304. Apices of elytra shortly bispinose—*erythromelas*, Boisd.

NOTE.—Described as from Tasmania, my specimens come from Perth, Western Australia.

305. Apices of elytra strongly bispinose, external spine very long—*cyanipes*, Saund.; *armata*, Thoms.; *longula*, Blackb.

NOTE.—The colour varies from blue-black to bright-blue. The widening of the prothorax is also variable, generally widest about the middle, sometimes sulcate within the margin, but in all cases examined the widest part is more advanced than in *erythromelas*.

306. Margins of prothorax and whole underside yellow—*marginicollis*, Saund.

307-420. Elytra yellow or red with basal margin, 2 fasciae and apex or preapical mark dark.

308-353. Apical mark covering apex of elytra.

309-350. Pronotum concolorous.

310-314. Size large, 15-20 mm. long.

311-315. All fasciae extending to sides.

312. Pronotum and underside coppery or green, apices shortly bispinose—*cupricollis*, Saund.

Pronotum and underside more obscure—var. *alterzona*, Thoms.; *deyrollei*, Thoms.

Pronotum black (probably discoloured variety of preceding)—*julia*, Thoms.

313. Pronotum blue, underside brilliant-violet, apex unarmed (?)—*cognata*, Kerr.

NOTE.—A species found near Sydney seems to correspond with the author's description, but has finely bispinose apices.

314. Margins of elytra red, male with yellow abdomen—*cruenta*, C. and G.

315. Size smaller, 10 mm. long—*vigilans*, Kerr.

316-375. Anterior fascia not extending to sides.

NOTE.—While in general this character holds true, exceptional cases occur.

317-345. Abdomen dark.
318-329. Size large, 14-21 mm. long.
319. Ground of elytra yellow, margins red, neither fascia reaching sides—*blackburni*, n. sp.
320-329. Ground of elytra red.
321. Form wide, pronotum and underside blue—*robusta*, Saund.

NOTE.—Fasciae variable, sometimes only spots, or (rarely) wanting, apex always narrowly cyaneous.

322-330. Form narrower.
323-325. Pronotum blue-black, apices of elytra widely lunate and strongly bispinose.
324. Elytra sinuate, slightly obovate, intervals strongly convex and finely punctate—*thomsoni*, Saund.
325. Elytra much attenuated at apex, intervals flat and strongly punctate—*pisciformis*, n. sp.

NOTE.—*pisciformis* has the prothorax strongly bulging near base, with much denser and coarser punctures than *thomsoni*.

326-329. Pronotum bronze-green, underside green.
327. Form elongate and depressed, apices finely bidentate—*helmsi*, Cart.
328-330. Form cylindric.
329. Underside green, apices acuminate with oblique excision—*trifasciata*, C. and G.; *apicalis*, C. and G.; *tacita*, Kerr.
330. Pronotum and underside bright-blue, apices bispinose—*kirbyi*, Guér.; *vivida*, Hope.
331-336. Size, 12-14 mm long.
332-338. Ground of elytra yellow.
*333. Pronotum bronze-green, elytral markings blue—*affabilis*, Kerr.; *simplex*, Kerr.
334-336. Pronotum bronze, elytral markings black (or nearly so), apices bispinose.
335. Postbasal yellow band wide, apical spines long—*rectifasciata*, Saund.
336. Postbasal yellow band narrow, apical apices subobsolete—*colligens*, Kerr.
337-345. Size small, 10 mm. long or less.
338. Pronotum black, form narrowly cylindric, apices acuminate with oblique excision—*tripartita*, Kerr.

NOTE.—This species very near and possibly a small variety of *atricollis*, Saund.

339. Pronotum bright-blue, elytra red with bright-blue fasciae—*vegeta*, Hope; *coeruleiventris*, Saund.; *haroldi*, Saund.; *viridiventris*, Saund.; anterior blue band extending to base, var. *cruentata*, Kirby; *neologa*, Thoms.; *coerulea*, Kerr.; *coelestis*, Kerr.; *stillata*, Blackb.

NOTE.—Kirby's name has the priority, but this colour variation is less common than that of Hope's type.

340-345. Second elytral interval wider than rest and subcostiform.
341-344. Pronotum bronze, sometimes greenish, scarcely sulcate.
342. Light bands of elytra red, apices widely lunate, external spine long—*plagiata*, Gory; *crenata*, C. and G.; *sexplagiata*, Gory; *bicruciata*, Hope; *hopei*, Boh.; *similata*, Boh.

343. Light bands of elytra with external parts only red, apices more finely lunate and shortly bispinose—*crenata*, Don.; *kreffti*, Macl.; *variata*, Kerr.
344. Light bands of elytra testaceous throughout—*generosa*, Kerr.
345. Pronotum black, very convex, with deep medial sulcus—*carinata*, Macl.
346-350. Abdomen yellow or red.
347-349. Posterior margins of elytra entire.
348. Pronotum bronze-green, anterior fascia antemedial—*rubriventris*, Blackb.; *maculifera*, Kerr.
349. Pronotum coppery, anterior fascia medial—*secularis*, Thoms.
*350. Posterior margins of elytra denticulate, pronotum coppery or purple—*cara*, Blackb.; *placens*, Kerr.
351-353. Margins of prothorax yellow or red.
352. Disc of pronotum coppery, its margins and whole underside yellow—*bifasciata*, Saund.
353. Disc of pronotum blue, its margins and whole underside red—*castelnaudi*, Saund.; *thomsoniana*, Mast.; *laportei*, Kerr.
354-375. Subapical mark not extending to apex of elytra.
355-372. Prothorax concolorous.
356-360. 13 mm. long or more.
357. Form wide, sinuate and depressed, elytra red with blue-black fasciae—*felix*, Kerr.
358-360. Form cylindric, robust.
359. Margins of elytra red, markings nearly black—*burchelli*, C. and G.; *perplexa*, Hope; *languinosa*, Hope; *hostilis*, Blackb.
360. Margins of elytra not red, markings more brilliant—*sagittaria*, C. and G.; *gravis*, Har.; *obscuripennis*, Saund.
361-375. 12 mm. long or less.
362-367. Elytra red with dark fasciae.
363. Pronotum and underside bright-green, form cylindric—*amphichroa*, Boisd.; *sexspilota*, C. and G.; *sieboldi*, C. and G.; var. *cylindracea*, Saund.; var. *bucolica*, Kerr.
364. Pronotum bronze, underside blue, form obovate—*carminea*, Saund.
365-367. Pronotum and underside golden.
*366. Fasciae black, sides of elytra sinuate—*pulchra*, Saund.; *rostrata*, Thoms.
367. Fasciae light-green, short (often mere spots), sides parallel—*aureola*, Cart.
368-372. Elytra testaceous with dark fasciae, form depressed.
369-371. Apices of elytra bispinose.
370. Elytra without red margins, intervals uniform and flat—*hopei*, Saund.; *burchelli*, Hope; *placida*, Thoms.
371. Elytra with red margins, alternate intervals subcostate and wider—*punctatosulcata*, Saund.; *litigiosa*, Kerr.
372. Apices of elytra simply rounded—*punctatissima*, Saund.
373-375. Margins of prothorax and underside yellow or red.
374. Elytra and prothoracic margins red (12×5 mm.)—*distinguenda*, Saund.

375. Elytra and prothoracic margins yellow (11×3·5 mm.)—*signata*, Kerr.

NOTE.—I have identified *signata* as a species taken lately by Mr. J. Dixon, of Melbourne, in the north-west district of Victoria. The description is merely confined to colour and size. If I am correct, the species often has the anterior fascia broken up into spots, while the yellow colour so much predominates over the green that it can scarcely be said to be "*vert obscur, avec de.*" The same species has been determined by Blackburn for a specimen in the South Australian Museum as *distinguenda*, Saund., of which it may be a variety.

376-398. Anterior fascia often (or always) broken up into 3 spots.

377-389. Apical mark covering apex of elytra.

378-388. Prothorax concolorous, abdomen dark.

379. Apices clearly bispinose, spines equal, elytra red with green fasciae—*delectabilis*, Hope.

380-387. Apices acuminate, with narrow oblique excision.

381. Base of prothorax with pronounced medial lobe—*obscura*, Saund.; var. *transversipicta*, Thoms.

382-387. Base of prothorax nearly straight, form cylindric.

383. Elytra orange-red, pronotum bronze—*recta*, Saund.

384-388. Elytra testaceous.

385-387. Elytral intervals flat.

386. Pronotum and fasciae blue-black, anterior spots not in a horizontal line (11 mm. long)—*atricollis*, Saund.

387. Pronotum and fasciae bright-blue, anterior spots in a horizontal line (8-9 mm. long)—*deserti*, Blackb.

388. Elytral intervals convex, apices more widely excised—*suavis*, Kerr.

389. Abdomen yellow, size large (16-19 mm. long)—*alexandri*, n. sp.

390-398. Subapical mark not at the apex of elytra.

391-393. Margins of elytra sanguineous.

392. Intervals flat, suture partly dark, markings blue—*rubrocincta*, Gehin.

393. Alternate intervals subcostate, suture dark throughout, markings bright-green—*alternecosta*, Thoms.; *alacris*, Kerr.; *quadrinotata*, Blackb.

394-398. Margins of elytra not sanguineous.

395-397. Pronotum bronze.

396. Posterior half of suture dark—*piliventris*, Saund.

*397. Whole suture dark—*crux*, Saund.

NOTE.—I have not been able to identify this species, which must be very close to several of its neighbours, and possibly a variety of *piliventris*.

398. Pronotum green or blue, whole suture dark—*scalaris*, Boisd.; *cyanicollis*, Boisd.; *subtrifasciata*, C. and G.; *media*, Hope; *crucigera*, C. and G.; *prudens*, Kerr.

399-420. Anterior fascia bifurcate laterally, leaving lateral spot yellow or red.

400-409. Yellow or red postbasal marks continuous with lateral spot.

401. Form elongate, flat, elytra red, apices simple (19-23 mm. long)—*insularis*, Blackb.

402. Form subcylindric, elytra yellow, apices bispinose (15-16 mm. long)—*browni*, n. sp.

403-417. Size smaller, 12 mm. long or less.
404-408. Pronotum bronze.
405-407. Underside bronze.
406. Apices of elytra bispinose, elytral markings coppery—*cupricauda*, Saund.
407. Apices of elytra feebly excised, elytral markings black—*inconspicua*, Saund.
*408. Underside blue, apices of elytra distinctly spinose—*acuticeps*, Saund.
409. Pronotum and underside metallic-green or bluish—*flavovaria*, Saund.; *flavopicta*, C. and G.; *timida*, Kerr.
410-420. Yellow postbasal marks isolated and round.
411-418. Prothorax concolorous.
412-415. Posterior margins of elytra serrated.
413. Pronotum, underside, and elytral markings coppery or violet-bronze—*violacea*, Macl.; *cupreoflava*, Saund.; *equina*, Blackb.
414. Pronotum blue-black, widest at base, feebly convex, fasciae green-black—*australasiae*, C. and G.; *simulata*, Hope; *melbournensis*, Thoms.
415. Pronotum green-bronze, widest at middle, very convex, fasciae blue-black—*assimilis*, Hope.
416-418. Posterior margins of elytra entire.
417. Pronotum nitid-bronze, smaller than preceding—*puerilis*, Kerr; var. *atrocoerulea*, Kerr.
418. Size small (6 mm. long), pronotum brilliant-bronze—*minuta*, Blackb.
419. Pronotum fiery-coppery at sides, its disc and elytral fasciae bright-green—*cydista*, Rainb.
420. Pronotum with yellow margins, posterior margins of elytra serrated—*eremita*, Blackb.
421-423. Elytra testaceous, with 3 fasciae, and the apex dark.
422. Form narrow and acuminate, pronotum coppery, fasciae and underside blue—*quadrifasciata*, Saund.
423. Form shortly obovate, pronotum and underside green, fasciae bronze—*rotundata*, Saund.; (?) var. *aeneicornis*, Saund.

Note.—I have a specimen of *rotundata* from Sydney in which the fasciae are represented by mere dots; *aeneicornis* may well be another variety. I have never seen it identified.

S. crux, Saund., and *acuticeps*, Saund., are probably varieties of common species, but I have not sufficient evidence to convict them of synonymy; *marginicervex*, Thoms.; and *libens*, Kerr., have been omitted from the tabulation as impossible to identify from description only.

Stigmodera porosa, n. sp.

Pl. ix., fig. 5.

♀. Elongate-ovate. Head, antennae, prothorax, scutellum, and upper-surface of legs nitid greenish-bronze, underside and tarsi black-bronze, elytra brown-red, the numerous large foveae thereon black or nearly so, the base narrowly

dark-bronze. Apex of head and whole underside strongly villose, the hair on head yellowish, on underside white.

Head densely punctate and slightly rugose, scarcely depressed between eyes, with small smooth longitudinal ridge in the middle of the forehead, sometimes finely channelled at the middle of base. *Prothorax* moderately convex, width one and one-half times the length, straight at apex, bisinuate at base, with wide medial lobe, sides nearly straight on basal half, more strongly converging towards apex, posterior angles acute; disc densely and coarsely rugose-punctate, with smooth, nitid, vermiculate intervals, sometimes with vaguely-defined smooth medial line behind, and an even less-defined medial depression on anterior area. *Scutellum* widely oval, with central part depressed and finely punctate. *Elytra* slightly widened at shoulders and again behind the middle, then moderately converging to a wider apex; each elytron widely subtruncate, or with wide concave outline (as in *grandis*, Don., as depicted by Saunders), the whole surface covered with large foveae arranged more or less in longitudinal series, the raised nitid vermiculations themselves sparsely punctate. *Sterna* and episterna coarsely rugose, abdomen with round distinctly-separated punctures, sparse on centre, dense at sides, in both cases becoming much finer towards apex, basal margins of segments quite smooth. *Dim.*—28-30 × 12-13 mm.

Hab.—Queensland: Caloundra (H. Hacker).

Three specimens in the Queensland Museum taken by Mr. Hacker are all female. The species is superficially like *sanguinosa*, Hope, from Western Australia, but differs markedly in the following characters, *inter alia*:—(1) Size larger, especially more robust, and less navicular. (2) Coloration less vivid, the underside and elytral foveae metallic-black in *porosa*, golden copper or green in *sanguinosa*. (3) Apex of elytra entirely different. It belongs to *Sect. b.*, *Stigmodera*, as classified by Kerremans (Genera Insectorum, p. 204).

Note.—After six months the colour of the elytra becomes much darker, the red only noticeable at the apex, the prevalent tone being blue-black, with here and there gleams of the brown-red.

Stigmodera franca, n. sp.

Pl. ix., fig. 11.

Oblong-ovate. Head, underside, and legs blue-black, pronotum bronze-black with violet reflections, antennae and tarsi black, elytra chestnut-brown with a narrow basal margin, the suture and apex widely blue-black, scutellum blue.

Underside, legs, and tarsi rather thickly clad with long whitish hair.

Head canaliculate but not excavate in front; densely and finely rugose punctate. *Pronotum* 12 × 8 mm., moderately convex, apex nearly straight, base moderately bisinuate, widest at base, sides rather strongly sinuate in front of the acutely-produced posterior angles, thence sharply narrowed anteriorly, base exactly twice as wide as apex; distinctly channelled for the greater part, the channel terminating behind in a large smooth depression; disc in general evenly and closely punctate, with some irregular, smooth areas towards the obtuse anterior angles. *Scutellum* cordate, laevigate with a carinate margin. *Elytra* considerably wider than prothorax at base, and nearly two and a half times as long, sides sinuately widened behind middle, each apex rather widely subtruncate (a little rounded), the sutural points feebly produced and divergent, posterior margins entire; striate; each elytron with four wide, scarcely-raised costae, the wider intervals between these irregularly rugose-punctate, the costae and raised parts of intervals with smaller punctures. *Sternum* coarsely punctate, the prosternum transversely ridged; abdomen more finely punctate, the punctures smaller towards apex. *Tarsal hooks* with well-developed dentate enlargement at their origin. *Dim.*, 40 × 16 mm.

Hab.—North Queensland: Upper Mulgrave River (Coll. of C. French).

A single female specimen has an elytral pattern somewhat as in *latithorax*, Thoms., or *thoracica*, Saund., with a darker ground colour than either of these. The sculpture of the elytra is somewhat like that of *gigas*, Gehin., or *latithorax*, Thoms., but the smaller more attenuate, concolorous prothorax easily distinguishes it from these. The surname and Christian name of the distinguished naturalist in whose collection the type is contained being both preoccupied in *Stigmodera* I have used a Latinized form of his name to denote this fine species.

Stigmodera gigas, n. sp.

Pl. ix., fig. 6.

Oblong-oval, robust. Head black, with two red spots between the eyes, pronotum mottled red and black, the smooth raised vermiculations red, with irregular black spaces; elytra brownish-black with narrow orange-red border: underside, legs, and antennae nitid-black, except for a small red spot on the flanks of the prosternum.

Head scarcely concave, lightly canaliculate, sparsely punctate. *Prothorax* 10 × 16 mm., very wide and convex

(sub-bulbous), straight in front, bisinuate behind, with middle lobe very wide, the base of elytra angulately fitting into excisions on each side of the middle lobe; widest behind middle, sides widely rounded and strongly crenated, anterior angles deflexed and obtuse, posterior subrectangular; disc irregularly sparsely and coarsely punctate, the punctures almost entirely limited to the smaller black areas, medial line smooth, neither raised nor depressed. *Scutellum* subcordate, depressed in front, laevigate, sometimes with red spot. *Elytra* wider than prothorax at base and three and a half times as long, shoulders obtusely angulate, sides sinuately widening behind the middle, thence narrowing to the truncate apex; deeply striate, intervals widely convex, very sparsely punctate, humeral region rugose. *Prosternum* and flanks of metasternum vermiculose-rugose; abdomen with large elongate scattered pits, bearing smaller punctures within, apical segment vermiculose-rugose. *Dim.*, 45-53 × 20-23 mm.

Hab.—Western Australia: Southern Cross, also Tammin. Type in Macleay Museum.

A species allied to *grandis*, Don., but distinguished as follows:—

S. grandis.	*S. gigas.*
Head without spots.	With two orange spots.
Prothorax rather flat, widest at base, rugose-punctate, margins widely orange.	Very convex, widest behind middle, sparsely and coarsely punctate, red colour prevalent over whole surface.
Elytra not wider than prothorax at base, coarsely and densely punctate, apex with strong external tooth, orange margin extending over three intervals on basal half.	Sparsely punctate (except at shoulders), apex with subobsolete exterior tooth, orange margin extending over two intervals on basal half.
Underside aeneous - black, densely pubescent.	Black, slightly pubescent.

Four specimens examined, two of which (the sexes) are in the collection of Mr. W. Duboulay, taken by his father, Mr. F. H. Duboulay, at Tammin. Mr. Duboulay has also sent one to Mr. C. French.

Stigmodera barbiventris, n. sp.

Pl. ix., fig. 7.

♂. Elongate-navicular. Head, prothorax, underside, legs, and antennae dark nitid green-bronze, prothorax narrowly bordered orange: elytra tawny-yellow on disc with wide

darker band towards sides and apex, extreme lateral border orange-yellow as on prothoracic margin, red at apex. (The lighter colour on disc confined to the costate intervals, the wide sulci being dark-brown.) Head and the whole underside densely covered with long white hair.

Head coarsely rugose, forehead nearly flat, scarcely excised, and faintly channelled, strongly produced in front. *Prothorax* rather flat, bisinuate at apex and base, the latter nearly twice as wide as apex, anterior angles produced and obtuse, sides crenated, gently rounded and diverging to the base, posterior angles rounded; surface coarsely vermiculate-rugose, the raised rugosities smooth and nitid, two deep basal foveate punctures. *Scutellum* subcordate, smooth. *Elytra* widening at the shoulders, then gradually and regularly tapering to the apex, each elytron strongly bispinose at apex, the exterior spine unusually long. Each elytron with ten costiform intervals, including the sutural but excluding the subcostate margins, the sutural costae terminating in the apical spine, the second costa short and joining the fourth near base, the fourth similarly connected with the sixth; costae 7-10 commencing behind the humeral swelling, the ninth subobsolete; the costae smooth except for a few large punctures; the sulci between costae wide and rugose-punctate, with evident rows of large punctures forming crenulations to the sides of costae. The whole *underside*, where not obscured by dense hair, rugose, the raised vermiculation nitid; last segment of abdomen with arcuate excision. *Femora* coarsely punctate with long hairs, tarsal claws widened at base into a small lobe. *Dim.*, 42 × 16 mm.

Hab.—Victoria: Beechworth. Type ♂ in the National Museum, Melbourne; ♀ in Mr. Lea's collection, labelled New South Wales (probably Inverell).

I have only seen these two specimens of this fine species. The female presents a slight variation in the apical structure, the wide space between the long external and the short sutural spines containing an angulation, obtusely dentate, making each apex subtrispinose. There is no sign of this in the male specimen. The two are otherwise alike, except for the usual sexual distinction in the last abdominal segment, in which the female has a stronger tuft of hair than the male. The species is very distinct from all the other described larger species.

STIGMODERA GLORIOSA, n. sp.

Pl. ix., fig. 8.

♀. Oblong-ovate, robust. Antennae brilliant bronze; head and pronotum brilliant golden-green, the former with an elongate orange spot on the face, the latter with large

rounded orange markings near the hind angles and a small one near the middle basal fovea; scutellum very nitid and brassy; elytra orange-red, with basal margins brilliant green, two wide fasciae and the apex widely obscure green, the first of these antemedian, sinuate on its anterior margin, extending from shoulder to shoulder, concave to the front and not reaching the sides; the second postmedian, nearly straight, extending to the sides and there produced to meet the wide basal dark-green marking; prosternum, legs, margins of meso- and meta-sternum, and margins of abdominal segments brassy-green, episterna and rest of underside yellow.

Head canaliculate, but not excavate between eyes; irregularly punctate, with a few smooth raised spaces, closely punctate towards sides. *Prothorax* very convex and wide, apex bisinuate, anterior angles produced and rounded, base twice as wide as apex, strongly bisinuate, the middle lobe widely subangulate, posterior angles produced and acute; widest near base, sides regularly rounded; disc irregularly punctate, the punctures finer near middle, coarser and closer (subrugose) at sides, a smooth medial line near base, a transverse foveate depression at middle of base and two short longitudinal sulci intersecting the base towards the hind angles. *Scutellum* oval, convex, and smooth. *Elytra* slightly wider than and more than three times as long as the prothorax, widened behind shoulders and widest behind the middle; sides not serrated, apex widely rounded, not spinose. Each elytron with ten striae besides a short scutellary stria, intervals convex and sparsely punctate, the fourth and eighth with a row of larger punctures. *Sternum* coarsely punctate and sparsely clad with long white hairs, abdomen with basal segments coarsely, apical very finely punctate. *Femora* finely and sparsely punctate; tarsal claws strongly toothed at their origin. *Dim.*, 42 × 19 mm.

Hab.—Western Australia: Murchison district. Type in National Museum, Melbourne.

This magnificent insect from French's collection is unique in the Melbourne Museum, but was evidently undescribed. Belonging to the *sexmaculata*, Saund., *fortnumi*, Hope, and *regia*, Blackb., section, in form and pattern, but differing from all these in the strongly convex prothorax, and like *conspicillata*, White, in the basal red spot on thorax. The elytral pattern is most like that of *regia*, Blackb.. except that the whole apical region is dark coloured. The elytra are a little displaced in the specimen, but if closed the apex would form one continuous wide curve, without tooth or excavation. Mr. H. W. Brown has also a specimen, taken by himself.

STIGMODERA IMPERIALIS, n. sp.

Pl. ix., fig. 9.

♀. Oblong-oval. Head basal part blue, face red margined blue and green, clypeus green-bronze, labrum reddish with long upright tufts of hair, antennae green; pronotum, elytra, and greater part of underside red, the first slightly violaceous, with narrow medial vitta and base blue, the second with basal border, straight postmedian fascia (not reaching sides or suture), and very narrow apical border black; the last with margins of abdominal segments, margins and middle of prosternum and metasternum metallic-blue, episterna red with a violet tinge; scutellum purple, femora red with base and apex blue, tibiae blue, tarsi blue above red beneath.

Head concave and finely canaliculate at base; with coarse scattered punctures on middle, more dense at sides. *Prothorax* 8 × 15 mm., rather depressed, widest at base, sides rather straight behind, then arcuately and subsinuately narrowed to apex, apex and base bisinuate, the former fringed with hair at margin, about half the width of base, anterior angles produced and subacute, base scarcely lobed at middle, posterior angles produced and acute; disc with smooth medial depressed line for the greater part, closely and rather finely punctate on middle, coarsely and closely on sides. *Scutellum* subcordiform, concave, and smooth. *Elytra* oblong, widened at shoulders and again behind the middle, there widest; sides nowhere serrated, apex subtruncate, or widely rounded with a short tooth at each sutural extension; with ten deep striae, the first bifurcating behind the scutellum, forming a short extra stria, the sixth and seventh originating behind the humeral callus, all intervals convex and sparsely and rather coarsely punctate. *Underside* coarsely punctate, the punctures becoming finer on abdomen, the front margins of segments quite smooth, sternum and first segment of abdomen with sparse long whitish hairs, otherwise almost glabrous. *Tarsi* with wide teeth at their origin. *Dim.*, 40 × 17 mm.

♂. 31-35 × 13-15 mm. Elytra without the postmedial fascia or apical coloration. The whole elytra orange-red. Two specimens in Mr. H. W. Brown's collection.

Hab.—Western Australia: Cue (H. W. Brown).

A magnificent insect, of which several specimens were captured by that indefatigable collector, Mr. Brown, at Cue. While standing near *vitticollis*, Macl., it is quite distinct from that species in its more brilliant and varied colour, narrower and shorter fascia, apex of elytron not bidentate, base of thorax not excised, etc. Type, female, in the author's collection.

STIGMODERA RUFOCYANEA, n. sp.

Pl. ix., fig. 10.

Elongate-oblong. Whole surface and appendages dark-blue, with the following sanguineous red markings, margins of prothorax, elytra with a wide oblong lateral patch behind the shoulder, and a wide lateral vitta extending from behind the middle to the apex.

Head lightly concave, canaliculate, closely punctate at base and sides, more distantly at middle and apex, the punctures round and deep, with two raised laevigate spaces on forehead. *Prothorax* 5 × 9½ mm., slightly bisinuate at apex and base, the former distinctly produced at middle, the latter with wide shallow medial lobe; widest at middle, thence nearly straight to the base and arcuately converging to the apex, this about two-thirds as wide as base: anterior angles obtuse, posterior produced and acute; disc rather flat, margins slightly explanate; irregularly punctate, punctures round, denser in front and sides, lateral margins rugose punctate; medial line laevigate, terminating behind in a wide shallow depression, two large basal foveae near margins. *Scutellum* oval, concave, laevigate. *Elytra* rather depressed, less wide than prothorax at base, sides subparallel, apex simply rounded; punctate-striate, intervals nearly flat except near apex, and sparsely punctate, the third and fifth meeting before the apex, as also the seventh and eighth, leaving a small rugose space. *Underside* finely and closely punctate, with irregular clothing of thick long hair. Hooks of *tarsi* very slightly enlarged at their origin. *Dim.*, 27 × 10 mm.

Hab.—Australia. (Type in Macleay Museum.)

A single female specimen in the Macleay Museum, labelled "Australia," is in form, especially of prothorax, like *limbata*, Don., and *menalcas*, Thoms., but is more depressed, with flatter elytral intervals; in colour it is not unlike *Metaxymorpha grayi*, Parry, the lateral blood-red markings contrasting with the dark-blue surface, making it an exceptionally beautiful species. *Chibanti*, Théry, has blue elytra, with prothorax having a red disc, besides other notable differences.

STIGMODERA NOTATICOLLIS, n. sp.

Pl. x., fig. 36.

♂. Elongate-oblong. Head cyaneous (or greenish) with pale pubescence, antennae golden-green, prothorax very dark-blue, with a small red spot at the anterior angles, and a large, oblique, triangular red mark on the sides; widest near, but not reaching the base, and narrowing to a fine angle near the

apex, and extending below over the greater part of the prothoracic episterna; elytra orange-red, sanguineous at sides, with the suture and apex narrowly cyaneous. In one specimen this sutural coloration enlarged behind the scutellum and again before the apex into a large macula, with a small spot of the same colour on each side near the middle. In the other specimen the postscutellary macula only slightly indicated; sternum and femora blue, tibiae and tarsi greenish, the last red on the underside, abdomen yellow.

Head lightly excavated and channelled, regularly punctate. *Prothorax* 4 × 6½ mm., convex, apex slightly produced in middle, base lightly bisinuate, the base of elytra fitting angulately into a small excision near posterior angles, medial lobe wide and straight behind, sides lightly and evenly rounded, anterior angles deflexed and obtuse, posterior a little produced and acute; disc finely and evenly punctate, with a smooth medial line, and a basal fovea at each excision. *Scutellum* elongate-ovate, concave, smooth. *Elytra* of same width as prothorax at base, sides nearly straight and without denticulation, apex without spines and subtruncate; striate, intervals nearly flat on disc, a little convex at sides and apex. *Sternum* finely, abdomen minutely punctate, the former rather densely clothed with long white hair. *Tarsal hooks* finely lobate. *Dim.*, 19-20 × 7½-8 mm.

Hab.—New South Wales: Berrima. Type in Macleay Museum.

Two male specimens in the Macleay Museum, with locality labels in the handwriting of the late Mr. Masters, are the only specimens I have seen of this distinct species. With the form of *praecellens*, Kerr., and *erubescens*, Blackb., the coloration of the elytra is somewhat as in *affinis*, Saund., with the prothoracic margins somewhat as in *conspicillata*, White.

Stigmodera blackburni, n. sp.

Pl. x., fig. 12.

Oblong-oval. Head, pronotum, and underside bright bronze, the first and third with a greenish tinge, the second purplish, elytra flavous-sanguineous at base and sides, with basal margin, two fasciae, and apical spot dark-green, the first fascia premedial, formed by three large maculae nearly connected but not extending to sides, the second postmedial, nearly straight, not quite reaching the sides, the apical spot large, bifurcated laterally, scutellum, legs, and tarsi green.

Head densely punctate, excavated, and channelled between eyes. *Prothorax* moderately convex, slightly advanced in middle at apex, nearly straight at base, widest behind

middle, thence converging gradually to base, more steeply towards apex, all angles obtuse; disc with large and scattered punctures on posterior half, finer and closer at sides and apex, a smooth medial line on basal half and two small foveae at base. *Scutellum* elongate-triangular, a large fovea on anterior, a few deep round punctures on central part. *Elytra* little widened behind shoulders and middle, three and a half times the length of prothorax, rather widely rounded behind, posterior margins serrated, the apices bidentate with small semicircular excision; punctate-striate, the intervals gently convex at middle, sharply so at sides and apex, a little wrinkled and sparsely punctate. *Sternum* with large round punctures close and regular; abdomen with much finer and closer punctures and almost glabrous. *Tarsal hooks* simple. *Dim.*, 21 × 9 mm.

Hab.—South Australia (Blackburn Collection). Type (unique) in South Australian Museum.

A single female in the South Australian Museum is superficially like *alexandri*, but differing widely as follows:—(1) Wider and more robust form; (2) abdomen green-bronze; (3) apices of elytra more widely rounded and simply bidentate, not strongly spinose. From *robusta*, Saund., besides great differences in colour, it differs widely in form, being more elongate, with a quite different apical structure. The premedial fascia is concave towards the front and leaves a space of three elytral intervals at the sides; the postmedial fascia leaves only one interval uncovered on each side. I have much pleasure in naming a South Australian species after the scholarly entomologist who did so much to extend our knowledge of the insect fauna of Australia.

Stigmodera alexandri, n. sp.

Pl. x., fig. 13.

Elongate-ovate, subdepressed, strongly attenuated behind. Head, pronotum, sternum, antennae, and scutellum nitid-bronze, slightly greenish, legs bluish, the first blue at apex; elytra orange-yellow with the base narrowly, three antemedial oval spots, sometimes narrowly connected into a fascia, the sutural one largest and extending to the scutellum, the other two placed obliquely behind the humeral callus; a short postmedial fascia, widened at suture and the apex narrowly blue-black; abdomen yellow.

Head channelled and widely excavated, coarsely punctate. *Prothorax* convex, nearly straight in front, slightly raised in middle, bisinuate at base, with wide medial lobe; widest behind middle, the sides boldly widened near base

then obliquely narrowed to apex, subsinuate near the denticulate posterior angle, anterior angles depressed and acute; irregularly punctate, the punctures coarse and close at sides, sparse at base, close and fine towards apex, medial line smooth. *Scutellum* scutiform, depressed, and smooth. *Elytra* rather flat, more than twice as long as wide, of same width as prothorax at base, strongly attenuated behind, with apical margins serrated, each apex with a strong oblique lunation with a long external and short sutural spine; striate-punctate, intervals nearly flat, densely and finely punctate. *Prosternum* closely, mesosternum coarsely, metasternum and abdomen very finely punctate and sparsely pubescent. *Dim.*, 16-19 × 6-7 mm.

Hab.—Western Australia: Mullewa and Cunderdin (Miss J. F. May and Western Australian Museum).

Four specimens, one male, three female, vary in their elytral pattern; the three females are coloured as above, except that in one example the antemedial spots are narrowly connected to form a fascia, while in another the postmedial fascia is narrowly interrupted at the suture. In the male the only dark markings are a small spot on each shoulder, a small postmedial spot halfway between suture and sides on each elytron, and the extreme apex narrowly. There is no doubt as to the conspecific nature of the four examples. The male and one female were on the same card in Mr. Lea's collection from Mullewa; the other two, similarly labelled, from Cunderdin, were sent respectively from the South Australian and Western Australian Museums. The species are nearest to *jekellii*, Saund., from which it differs markedly in the wider basal two-thirds of the elytra, with its more attenuated apical third, and the strongly spined apex—this somewhat as in *semicincta*, C. and G., and *variopicta*, Thoms. The pattern is also different, the suture without any coloration. Type male in Mr. Lea's collection; female in South Australian Museum.

Stigmodera rufolimbata, n. sp.

Pl. x., fig. 14.

Elongate-ovate, rather flat. Head and pronotum bronzy-black, antennae and apex of the former blue, the sides of the latter bordered red or orange; elytra blue-black, varied with yellow or red as following; two large rounded or oval basal spots not extending to the base, an undulating medial fascia narrowed near but not reaching the suture and produced laterally to the humeral angle, a narrower arcuate postmedial fascia not reaching the suture and produced laterally (in one

example quite, in two examples not quite) to the extreme apex, the lateral coloration brightly sanguineous throughout; underside and legs steel-blue, very nitid. Clothed with sparse white hairs.

Head sharply sulcate on front. *Prothorax* nearly straight at apex, moderately bisinuate at base, sides of male subparallel on basal third, of female subsinuately narrowed at base; feebly arcuate at sides and gently narrowing to the apex, anterior angles slightly advanced and rounded, posterior angles subrectangular; disc rather coarsely and closely punctate, smooth medial line sometimes apparent, a small central basal fovea and two shallow lateral depressions. *Scutellum* triangular, concave. *Elytra* of same width as prothorax at base, slightly widening behind shoulder, subsinuate near middle (subparallel in male, slightly enlarged behind the middle in female), sides near apex minutely serrated, the extremity with small oblique lunation; each elytron finely bispinose, the exterior spine more prominent; striate-punctate, seriate punctures large and distinct, intervals convex throughout, more strongly raised on apical half, the fifth, sixth, and seventh abruptly starting behind the humeral enlargement; intervals minutely punctate. *Sternum* densely and coarsely, abdomen finely punctate. *Dim.*, ♂, 15-7 × 5-6½ mm.; ♀, 17 × 6 mm.

Hab.—Western Australia: Cue (H. W. Brown).

In form and pattern somewhat of the *decemmaculata*, Kirby, type; but larger and without the yellow subapical and head spots of that species; the underside blue, sides sanguineous, *inter alia*. The upper-surface is coloured almost exactly like *pallidiventris*, C. and G., var. *cincta*, Blackb. The irregular striation in the humeral region is unusually marked. Types in the author's collection.

Stigmodera browni, n. sp.

Pl. x., fig. 15.

Elongate-subcylindric. Head, antennae, pronotum, sternum, and tarsi dark-bronze, the head with coppery and blue, the sternum with some cyaneous reflections; elytra blue, with three yellow fasciae as following; first subbasal, oval fascia not reaching base or suture, but produced on shoulder and humeral epipleurae as far as the lateral sinuation, second a medial undulate fascia, narrowed internally and externally, third an anteapical arcuate fascia; the last two fasciae not reaching the suture, but extending to the sides. Abdomen blue, with long white hairs; legs greenish-bronze.

Head widely excavated and channelled between the eyes; rugose-punctate. *Prothorax*, 3 × 4½ mm., convex, widest near base, apex subsinuate, slightly advanced in the middle; base nearly straight, sides gently rounded and narrowing to apex, anterior angles a little advanced and obtuse, the posterior acute (about 80°); disc densely punctate, subrugosely at sides; a smooth medial line faintly indicated near base, terminating in a small fovea with two very shallow lateral impressions. *Elytra* of same width as prothorax at base, and three and two-thirds times as long, sides subparallel, lateral sinuosity scarcely evident from above, serrated near apex, extremity with moderately wide oblique lunation; each elytron shortly bispinose, exterior spine conspicuous; striate-punctate, intervals flat on disc, sharply costate near apex, rather coarsely and unevenly punctate. *Sternum* coarsely rugose, abdomen with first two segments densely and coarsely, the apical more finely punctate. *Dim.*, 15-16 × 5 mm.

Hab.—Western Australia: Cue (H. W. Brown).

In form somewhat near *longicollis*, Saund., in pattern near the *australasiae*, L. and G., type; but the prothorax is more cylindric than that of the former species, as depicted by Saunders, while the blue coloration is much more vivid than in *australasiae*. Two specimens sent by its indefatigable captor. Type in the author's collection.

Stigmodera desideria, n. sp.

Pl. x., figs. 16 and 17.

Elongate subparallel, moderately convex. Head, thorax, underside, legs, and elytra blue or violet-blue, the last marked yellow as follows. Male with wide subbasal fascia parallel to the base, but not reaching it nor the suture, and produced widely on the sides to beyond the middle, two antemedian pear-shaped maculae, one on each side of the suture, an irregular horizontal anteapical fascia extending to the sides but not reaching the suture; in the female the subbasal fascia is produced downwards on the disc to meet and include the antemedian spots; antennae and tarsi bronze.

Head excavated and canaliculate on front, regularly and closely punctate. *Prothorax* widest at middle, apex and base bisinuate, the latter more strongly so; sides evenly rounded, slightly narrowing to the apex; disc rather unevenly, not coarsely punctate, densely so at the sides, a depressed smooth medial line evident on basal half, terminating in a minute fovea; two slight lateral depressions. *Scutellum* subcordate, concave, laevigate. *Elytra* slightly enlarged at shoulders,

little constricted at middle, border serrated near apex; each elytron bispinose, with small oblique excision at extremity, exterior spine the more prominent; striate-punctate, seriate punctures small, intervals flat on disc, the sutural intervals costate towards apex, intervals unevenly and sparsely punctate. *Abdomen* and sternum finely punctate, and sparsely clothed with whitish hair. *Dim.*, ♂, $14\frac{1}{2} \times 5$ mm.; ♀, 16×6 mm.

Hab.—Western Australia: Cue (H. W. Brown).

The sexual coloration as above may be accidental and individual, but the pattern alone distinguishes it from other described species. Somewhat similar in shape to *browni (supra)* and *longicollis*, Saund., it is flatter and less cylindric than the former. The only species to which it may be compared in colour scheme of the elytra is *praecellens*, Kerr., but in general form and structure is nearest to *longicollis*, Saund. Types in the author's collection.

Stigmodera neglecta, n. sp.

Pl. x., fig. 18.

Elongate-ovate. Head, pronotum, and underside blue, pronotum and sternum with some bronze reflections; elytra yellow with the following dark-blue markings; basal margin, wide oblique vitta behind the shoulders, an elongate-oval antemedial spot on the suture, wide postmedial fascia and apical patch, the sutural spot, fascia, and apical patch connected along the suture; antennae and legs blue.

Head furrowed and lightly excavate in front; densely, not deeply punctate. *Prothorax* lightly convex, nearly straight at apex, strongly bisinuate at base, widest at base, sides arcuately narrowing to apex, all angles a little acute; disc with large round punctures, sparsely placed behind, becoming dense and finer on front half; with an elongate central fovea and two oval foveae at base. *Scutellum* cordate and depressed. *Elytra* slightly wider than prothorax at base, sides lightly sinuate, apex bidentate with a rather wide shallow excision between teeth, posterior margins entire; striate-punctate, intervals flat on middle, strongly convex at sides and apex; quite impunctate (except in humeral swelling). *Sternum* strongly, abdomen very finely punctate and clothed with dense recumbent hair. *Dim.*, 17×7 mm.

Hab.—New South Wales: Blue Mountains. Type in author's collection.

I find a female specimen misplaced amongst a series of *undulata*, Don., which it resembles closely at first sight, especially in the elytral pattern and size; otherwise I can

find nothing very near it. The following comparison with *undulata* will serve to distinguish it, *inter alia*.

S. undulata.	*S. neglecta.*
Colour — Head, pronotum, and underside bronze-green, elytral markings dark-green.	Head, pronotum, underside, and elytral markings blue, prothorax above and below with patches of bronze.
Prothorax strongly convex, widest near middle.	Lightly convex, widest at base.
Apices of elytra simply rounded.	Widely excavate and bidentate.
Abdomen glabrous, or nearly so.	Densely pubescent.

STIGMODERA PROPINQUA, n. sp.

Pl. x., fig. 19.

Elongate, subcylindric. Head, antennae, prothorax, legs, and underside blue, the last very brilliant; elytra yellow, with two small humeral spots and a sutural spot between these, a straight (sinuate on its margins) postmedial fascia, and a preapical macula varying from elongate-ovate to triangular, blue-black, the last produced to the apex at the suture.

Head moderately excavated and rather deeply channelled, closely punctate. *Prothorax* convex, apex slightly produced at middle, base very lightly bisinuate, widest at base, thence arcuately converging to apex, anterior angles deflexed and widely obtuse, posterior deflexed and subrectangular, disc evenly, not coarsely, punctate, smooth medial line indicated near base, terminating in a shallow fovea. *Scutellum* subcordate, concave, laevigate. *Elytra* of same width as prothorax at base and about three times as long, sides very lightly sinuate, apex minutely lunate and very shortly bispinose; striate-punctate, intervals convex throughout, minutely and sparsely punctate. *Sternum* coarsely and densely, abdomen finely and densely punctate. *Dim.*, 15 × 5 mm.

Hab.—South Australia. Types in Macleay Museum.

Two specimens (the sexes) in the Macleay Museum are near *convexa, mihi*, in colour and pattern of the elytra, but differ markedly in the following details; colour of prothorax and underside (coppery-bronze in *convexa*), less cylindric form, much less strongly punctured surface, with entire absence of any denticulation of sides near apex, the antemedial spot not connected with the fascia on the suture. It differs from *longicollis*, Saund., in its much shorter prothorax and different elytral pattern, more convex form, etc.

S. convexa, Cart.—In my description of this I stated of the elytra, "Margins entire to apex." There is, however, a minute denticulation quite close to the apex, which I overlooked.

STIGMODERA PISCIFORMIS, n. sp.

Pl. x., fig. 20.

♂. Ovate, much attenuated behind. Head dark-bronze, prothorax, scutellum, and underside dark-blue with bronzy reflections, antennae and legs blue, elytra red, with the base, two straight fasciae (the first antemedian, not extending to the sides, branching at the suture to the base, the second postmedian extending the full width and slightly widened at the middle), and the apical tenth blue-black, the apical macula with straight anterior margin.

Head deeply excavated, widely channelled, punctate and pubescent. *Prothorax* very convex, widest (subangulately widened) a little in front of base, thence rather straightly narrowing to apex, apex arcuate, base bisinuate and less than twice as wide as apex, medial lobe wide, anterior angles slightly produced and acute, posterior obtuse; disc rather strongly punctate, the punctures round and close, subconfluent at the sides, medial line smooth. *Scutellum* subcordate, concave, laevigate. *Elytra* depressed, of same width as prothorax at base, widened behind shoulders, lightly sinuate at middle, apical third strongly narrowed, denticulate at margins, the apex of each elytron with strong oblique lunation and bispinose, exterior spine prominent; striate-punctate, intervals flat or nearly so throughout, distinctly but sparsely punctate. *Sternum* coarsely, abdomen finely and densely punctate, almost glabrous.

♀. Differing only in colour from the male. Pronotum and underside with bronzy tints prevailing over the cyaneous, the antemedian fascia only represented by humeral spots and an enlarged sutural macula, the post medial fascia absent. *Dim.*, 15 × 5 mm.

Hab.—South Australia (types in Macleay Museum); Western Australia: Eucla (C. French).

Three specimens examined are the only examples I have seen. It is not, therefore, possible to state that the above coloration is a constant sexual difference, but I am convinced that the three examples are conspecific. The form of both prothorax and elytra is unusual, the former abruptly widened near the base, the latter strongly attenuated and spinose. The nearest to it in general form are *confinis*, Kerr., and *thomsoni*, Saund., but differs from the latter, besides markings in less sinuate and more attenuated form, and its flat and distinctly punctate elytral intervals.

STIGMODERA ARGILLACEA, n. sp.
Pl. x., fig. 21.

Moderately convex, oblong, sharply attenuated behind. Head dark-blue, pronotum dark-bronze with coloured reflections, the former with large yellow spot on centre, the latter evenly bordered yellow, scutellum, antennae, and tarsi blue, elytra brick-red with the following markings peacock-blue, wide basal and apical margins, suture, two fasciae, the first (not quite reaching the sides) in front of, the second (extending to sides) behind the middle, and a nearly straight longitudinal vitta from the humeral angle to the first fascia (leaving an elongate red patch at the sides); between the second fascia and the apex the suture widened into a diamond-shaped spot; underside yellow, abdominal segments margined red, femora and (in part) tibiae red, rest of tibiae peacock-blue.

Head with shallow channel between eyes but not excavated; metallic parts coarsely, the yellow spot more finely punctate. *Prothorax* arcuate at apex, bisinuate at base, sides widest behind middle, arcuately narrowed to apex, all angles slightly obtuse; disc densely punctate, except near base, the punctures here larger and more distinct. *Scutellum* cordate, concave, nearly smooth. *Elytra* with narrow collar at base, forming a bead-like projection at shoulder, sides widened behind shoulder and slightly so behind middle, then converging sharply to apex; each apex trispinose, the middle spine longest, posterior margins entire; striate-punctate, the punctures in striae small, intervals flat on middle, convex at sides and apex, and themselves strongly punctate, the punctures thereon as large as those in the striae. *Underside* glabrous, with coarse shallow punctures, coarse on prosternum, fine on abdomen. *Dim.*, 13-15 × 5-5·5 mm.

Hab.—North-western Victoria: Hattah (J. E. Dixon).

Four examples sent by Mr. Dixon, who captured many others in this district. While belonging to the *8-spilota*, C. and G., group, and a near ally to that species, it is clearly distinct not only by ground colour, and that of the legs and pattern, but especially in the quite different and coarser punctures of the elytral intervals, besides being of a slighter and different shape. I have compared it closely with the type of *rufipes*, Macl., and find a similar difference of sculpture, besides differing in pattern and colour, though alike in its leg coloration. In one of my examples the premedial fascia is interrupted. Types in the author's collection.

N.B.—*S. rufipes*, Macl., though possibly a variety of *8-spilota*, C. and G., differs from the typical form in the following. *Prothorax* with red line near and parallel to apex

and a red spot at middle near base. *Elytra* with dark violaceous markings as follows: base, apex (widely), postmedial fascia, oval shoulder vitta; suture, the last widened into a diamond-shape spot opposed to the lateral vitta, the prothoracic margin narrow in front, much widened behind (as in *8-spilota*). Form oblong, scarcely enlarged behind middle. There are two specimens in the Macleay Museum. The name should be kept for this well-marked Queensland variety.

STIGMODERA SERRATIPENNIS, n. sp.

Pl. x., fig. 22.

Elongate-ovate. Head, pronotum, and scutellum violet-black, the first with a large yellow spot, the second with the margins widely yellow; elytra violaceous, large oval base, small preapical, epipleural spots, and two fasciae yellow, one medial the other postmedial, both extending to sides but not to the suture; centre and flanks of prosternum, the greater part of mesosternum and metasternum, first abdominal segment, and the middle and sides of the other segments yellow, the rest of underside and legs bronze-black, with short sparse hairs.

Head slightly concave, widely channelled, with sparse round punctures. *Prothorax* straight in front, lightly bisinuate behind, anterior angles obtuse, posterior rectangular, widest behind middle, sides evenly rounded, disc moderately punctate, with smooth medial line. *Scutellum* cordate, deeply foveate or subsulcate on anterior half. *Elytra* convex, slightly widened at shoulders, sides gradually narrowing behind, strongly and coarsely serrated on apical third; extreme apex lunate, with each clearly bispinose, the sutural spine short, the outer dentate. *Dim.*, 15-16 × 5-6 mm.

Hab.—Western Australia: Cue (H. W. Brown).

Two specimens examined come very near the well-known *8-spilota*, C. and G., and *10-maculata*, Kirby, but differ from both in—(1) elytral pattern, the medial and postmedial spots being replaced by fasciae extending to the sides; (2) legs and dark portions of underside dark-bronze, instead of blue or variegated, with more dark colour than in the above-mentioned species; (3) the strong serration of apical border of elytra (entire in *8-spilota* and *10-maculata*); (4) each apex bispinose, instead of trispinose. Type in the author's collection.

STIGMODERA MACULICOLLIS, n. sp.

Pl. x., fig. 23.

♂. Elongate-ovate, attenuated in front and behind. Head and antennae black, the excavate front red, with a

black spot at the base; pronotum red with a central black macula covering a large portion of disc; elytra red with a narrow basal border and the apex black; underside black, with the prosternum, spots on the mesosternum and metasternum, and a transverse band on each abdominal segment red; legs variegated, the upper-surface of femora and base of tibiae black, the rest and tarsi red.

Head widely excavated between the eyes, rather distantly and clearly punctate. *Prothorax* moderately convex, sides rather strongly widened behind middle, thence gradually converging to the apex and more suddenly towards the base, apex slightly, the base strongly bisinuate, apex somewhat advanced at middle, the middle lobe of base wide, with the base of elytra subangularly produced forward halfway between the scutellum and posterior angles, the last subacute; disc with clear round punctures, irregularly not closely placed, a smooth medial line on basal half. *Scutellum* subcordate, raised, with depressed centre, and finely punctate. *Elytra* rather flat, slightly expanded and widest at the shoulders, compressed at middle and thence converging to the apex; each elytron strongly bispinose at apex, the exterior spine the longer, space between spines rather narrow; striate-punctate, seriate punctures small and close, intervals moderately convex, more strongly so towards sides and apex, and transversely striolate, with a few small punctures. *Underside* glabrous, evenly and finely punctate. *Dim.*, 14 × 5 mm.

Hab.—Queensland. Type in National Museum, Melbourne.

A single specimen from the French Collection in the Melbourne Museum is labelled "Queensland, *sp. nov.*," the last words in the handwriting of the late Canon Blackburn. It is not very close to any described species, and may be recognized by its unusually coloured pronotum and the variegated legs and underside.

Stigmodera haswelli, n. sp.

Pl. x., fig. 24.

Cylindric, robust. Head, pronotum, and sternum dark-green, the first blue at apex, the second with bronzy reflections, scutellum and legs blue, elytra orange-yellow, sanguineous at base and margins, with extreme base narrowly, and seven large spots bright blue; two oval placed obliquely behind the shoulder, with a club-shaped spot on suture between these, having a narrow extension to the scutellum, three forming an interrupted postmedial fascia, the sutural spot of these diamond-shaped (in one example narrowly connected on one side with the lateral spot), the two lateral

transversely extending to the sides, and a triangular apical spot, with its apex at the apex of the elytra, bordered on each side sanguineous; abdomen red.

Head excavated and channelled, and, like the pronotum, densely punctate. *Prothorax* very convex, nearly straight in front, slightly bisinuate behind, sides gently and evenly rounded, oblique anteriorly, anterior angles depressed and wide, posterior rectangular, without medial impression. *Scutellum* triangular, depressed, and punctate. *Elytra* of same width as prothorax at base, less than twice as long as wide, sides nearly straight, little narrowed behind, each apex subtruncate with two very short equal spines, subapical margins entire; punctate-striate, intervals closely and finely punctate, nearly flat on disc, the first three wider than the rest, external two costate. *Underside* finely punctate, with short white pubescence. *Dim.*, 12-13 × 4·7-5 mm.

Hab.—Queensland: Duaringa; and South Australia (?). Macleay and South Australian Museums.

Two specimens, both female, examined. The type from Duaringa, the other labelled "Jung" (collector's name), probably from South Australia. It is near *burchelli*, C. and G., and *cara*, Blackb., but differs from the first by its yellow abdomen and elytral pattern, from the second in the absence of sub-apical serration (said to be "*fortiter denticulatis*" in *cara*) and the widely subtruncate apices, besides having a different elytral pattern. I have named it after Professor Haswell, the honorary director of the Macleay Museum. Type in Macleay Museum.

STIGMODERA LEPIDA, n. sp.

Pl. x., figs. 25 and 26.

Elongate-acuminate, subcylindric. Head and pronotum dark violet-blue, the former with some coppery reflections, elytra blue with orange or brick-red markings as following: two oval basal spots not quite reaching the base, two narrower antemedial oval spots behind the former (in the female example the first pair coalesce with the second pair, forming an irregular longitudinal stripe); a narrow marginal stripe extending from the base to the end of the anteapical fascia (in the male this is narrowly connected with the basal spot, in the female not so); an irregular, postmedial, horizontal fascia, not nearly reaching the suture, and a somewhat similar anteapical fascia; underside of male dark metallic-copper, very nitid, of female blue-black, with coppery reflections.

Head and pronotum regularly punctate, the former depressed and channelled on front, the latter moderately convex, with faint indication of a medial line near the basal

fovea. *Prothorax* with apex nearly straight, base bisinuate, sides rounded and narrowed anteriorly, anterior angles depressed and obtuse, posterior subrectangular. *Elytra* narrowly subcylindric, acuminate at apex, the sides not serrated; each extremity with a small oblique excision, scarcely spinose; striate-punctate, the seriate punctures small and little evident, the intervals flat on disc, convex near apex, and almost smooth. *Sternum* finely, abdomen minutely punctate, with rather close, whitish pubescence. *Dim.*, 9-11 × 3-4 mm.

Hab.—Western Australia: Cue (H. W. Brown).

A small species, evidently very near but apparently not *mansueta*, Kerr.; also near *xanthopilosa*, Hope. The colour does not tally with the description of the former, the prothorax being blue (not green) and not "*sillonné longitudinalement.*" The elytral markings also are red (not yellow), while Kerremans says of his species, "*Moins acuminé au sommet et un peu plus large que S. elongatula*, Macl." In my species the apex is considerably more acuminate than in *elongatula*. Types in the author's collection.

STIGMODERA OCTOCOSTATA, n. sp.

Pl. x., fig. 27.

♂. Elongate-subcylindric. Head, antennae, and elytra uniform blue-black, pronotum yellow with three black markings, the first medial club-shaped, the oval club occupying the front part, with a straight stem exactly filling the wide medial sulcus on basal half, the other two dumb-bell shaped, symmetrically placed on each side of the middle, the basal ball of dumb-bell exactly occupying a round basal depression near the hind angles; prosternum yellow with a black basal border extending forward on each side; rest of underside and legs a rich dark-blue, quite glabrous.

Head excavated between the eyes, closely punctate. *Prothorax* convex, widest at middle, sides evenly and rather widely rounded, nearly straight at apex and base, a little wider at base than at apex, all angles obtuse; disc with wide central depression on basal half and two large depressed foveae at sides; densely and evenly punctate. *Scutellum* widely triangular, depressed, and punctate. *Elytra* strongly widened at shoulders, then subparallel to near apex, there each elytron very finely bispinose; base irregular, each elytron angulately produced forward at the middle, the angle being formed by the short scutellary costa meeting the raised humeral margin and overlapping the base of prothorax; disc with three well-raised costae, the first pair meeting within the basal angle and continuous to the apex, terminating there

in the short spines, the third costa originating behind the humeral callus and not quite extending to apex, the sides and suture also subcostate; between the suture and first costa is another shorter raised interval on basal half; all costae smooth and nitid, the interspaces densely and rather finely punctate. *Prosternum* and metasternum with large, rather distant punctures; abdomen densely and finely punctate. *Dim.*, 11·5 × 3·5 mm.

Hab.—Australia. Type in National Museum, Melbourne.

A single specimen from the French Collection in the Melbourne Museum bears no locality label, but is so distinct from all known species as to deserve description. While carinated, somewhat as in *impressicollis*, Macl., and *spinolae*, C. and G., so far as the elytra are concerned, it is very different in colour and form, notably in the curiously patterned pronotum and the quite irregular base of the elytra, with the angle not fitting into but overlapping the prothorax. It is unfortunate that the locality has not been accurately noted for this pretty little species.

STIGMODERA SEXNOTATA, n. sp.

Pl. x., fig. 28.

Elongate-ovate, attenuate in front and behind. Mouth and scutellum blue, head greenish-bronze, prothorax red, this colour extending over the prothoracic episterna, with a spade-shaped discal spot green-bronze, widely covering the apical, narrowly the basal half; elytra rufo-sanguineous, the discal parts paler, with the base and six spots blue, three a little in front of the middle, the sutural one slightly in front of the other two, three behind the middle, the sutural one behind the other two; sternum green-bronze; abdomen blue, densely clothed with white adpressed hair.

Head excavated, channelled, closely punctate. *Prothorax* convex, widest behind middle, apex arcuate, base strongly bisinuate, middle lobe produced, sides widely rounded a little in front of base, thence arcuately converging to apex, anterior angles embracing the head, and (seen from above) acute, posterior slightly produced, acute; disc densely punctate, a smooth depressed medial line on basal half terminating in a small fovea. *Scutellum* subcordate, depressed, laevigate. *Elytra* of same width as prothorax at base, widened behind shoulders, thence nearly straight, not much narrowed and minutely denticulate towards apex; each apex sharply bispinose, with a short internal and a rather pronounced external spine; striate-punctate, intervals nearly flat and rather densely punctate. *Sternum* strongly, abdomen finely

punctate, the latter obscured by hair. *Dim.*, 12-13 × 4-4¾ mm.

Hab.—Western Australia: Cunderdin. Type in Western Australian Museum.

Three specimens, identical in colour and markings, suggest *coccinata*, Hope, or *guttaticollis*, Blackb., in the prothoracic coloration, but are without the lateral spots of the former, and with larger discal markings than the latter. The elytral spots are placed as in *septemspilota*, *mihi* (which has the apex dark and is differently shaped). A very distinct species that I have seen in no other collection.

STIGMODERA ATTENUATA, n. sp.

Pl. x., fig. 29.

Elongate, attenuated in front and behind. Head coppery, with purple reflections, mouth blue, antennae green; pronotum purple with greenish reflections, elytra yellow with narrow basal margin green; scutellum red with green border; underside cyaneous, the episterna and margins of abdomen dark-green.

Head excavated and canaliculate, with rather large irregular punctures. *Prothorax* widest at base, slightly convex in middle, rather flat and explanate at sides, both apex and base very moderately bisinuate, the obtuse anterior angles a little produced, the posterior rectangular not produced, sides narrowed in a gentle curve from base to apex; disc finely punctate on middle, coarsely and sparsely at sides; a faint medial depression terminating behind in a round fovea; two large foveate depressions near the posterior angles. *Scutellum* cordate, depressed, and nearly smooth. *Elytra* elongate, navicular, three and one-third times as long as the prothorax, slightly widened behind shoulders, the sides then gradually tapering to a fine apex, nowhere serrated, apex lunate, and each elytron bispinose, the interior spine very short, the external long; striate-punctate, intervals irregularly and strongly costate as follows: third and fifth intervals strongly costate, together originating at the base, the third continuous to the base and produced into the strong external tooth, the fifth joining the seventh before the apex, the eighth, ninth, and tenth narrower than the third and fifth, and originating behind the humeral callus, sixth interval briefly carinate then widely convex, sutural, scutellary, and other intervals flat. *Prosternum* coarsely, the rest of underside very finely punctate, with sparse short hair. *Dim.*, 12-14 × 4-5 mm.

Hab.—Victoria: Fernshaw and Gippsland.

Two specimens (the sexes) examined belong to the *parallela*, Saund., section, but differ from that species in the navicular form, costate elytra, and the brilliant but dark coloration of the pronotum and underside. It is also near *impressicollis*, Macl., but differs in the form of prothorax and in the colour of pronotum and underside. Types in the National Museum, Melbourne.

Stigmodera planata, n. sp.

Pl. x., fig. 30.

Ovate, depressed. Head, antennae, prothorax, scutellum, underside, and legs golden-green, elytra pale-yellow.

Head excavated and channelled, closely punctate. *Prothorax* straight in front, bisinuate behind, anterior angles deflected and rounded, posterior slightly produced and subacute, widest at base, narrowing arcuately to the apex; disc densely evenly punctate, with a smooth medial line terminating at the base in a small fovea. *Scutellum* cordiform, depressed, smooth. *Elytra* ovate, rather flat, sides very little sinuate, not serrated behind; apex with a minute oblique lunation, finely bispinose; striate-punctate, the flanks of prosternum densely rugose-punctate. *Sternum* coarsely, abdomen very finely and densely punctate. *Dim.*, 13 × 5 mm.

Hab.—Western Australia. Type in the National Museum, Melbourne.

Two specimens, both male, examined. The species comes near *punctiventris*, Saund., and *dispar*, Blackb., and some varieties of *guttata*, Blackb., from all of which it differs in its more depressed form, more ovate elytra, and the close and even puncturation of the whole upper-surface (including the elytral intervals), and the absence of any dark coloration of the elytra (in one specimen there is a very narrow basal green margin perceptible). From *dispar*, Blackb., it differs in larger size, flatter surface, and smaller apical lunation. *Cinnamomea*, Macl., is sometimes very like it, but the abdomen is always yellow and the prothorax very different (more convex and with coarse sparse punctures); *iquea*, Blackb., is another ally, with coppery thorax and underside, with some dark markings on the elytra.

Stigmodera acuticollis, n. sp.

Pl. x., fig. 31.

Elongate-ovate. Head and pronotum nitid bronze-black or tinged with blue, elytra red with suture and extreme apex black, antennae, underside, and legs dark-blue.

Head excavated and channelled, regularly not densely punctate. *Prothorax* unusually short, moderately convex, arcuate at apex, bisinuate at base; widest at base, the sides converging in a feeble curve (a little sinuate near front) to apex, all angles distinctly produced and acute, the anterior markedly so; disc nitid, sparsely punctate, without any medial depression or line, with a medial basal fovea. *Scutellum* cordate, depressed in middle. *Elytra* slightly enlarged behind shoulders and again behind the middle, posterior margins entire, apices finely bispinose, exterior spine more prominent; punctate-striate, all intervals convex and finely punctate, the alternate intervals costate. *Underside* moderately closely punctate and nearly glabrous. *Dim.*, 11 × 4 mm.

Hab.—Southern Queensland: Duaringa, Brisbane (A. M. Lea). Type in Macleay Museum.

Two specimens examined belong to a species closely allied to *erythroptera*, Boisd., but differing as follows:—

S. erythroptera.	*S. acuticollis.*
Prothorax subbulbous, sides rounded, surface subopaque, densely and finely punctate, with deep central depression, angles wide.	Lightly convex, widest at base, surface nitid and sparsely punctate, without medial depression, angles acute.
Elytra, three costae on each, interspaces flat, posterior margins serrated.	Three costae on each, less strongly raised, with intermediate intervals also convex, posterior margins entire.
Surface above and below densely punctate.	Finely and more sparsely punctate.

In *subpura*, Blackb., the intervals are nearly flat and posterior margins serrated.

STIGMODERA TITANIA, n. sp.

Pl. x., fig. 32.

Narrowly elongate-oblong. Head, antennae, prothorax, scutellum, underside, and legs brilliant greenish-bronze, margins of prothorax with wide pear-shaped yellow markings narrowing to the apex, the widened part not quite reaching the base, and produced widely on the prothoracic episterna; elytra testaceous with the following markings blue-black, the base connecting with a large oval spot covering the humeral region, a straight postmedian fascia extending to the sides, deeply trifid on its anterior, less deeply so on its posterior margin and the apex, the last with a straight anterior margin.

Head deeply excavate, narrowly sulcate, closely punctate. *Prothorax* bulbous, apex straight, base strongly bisinuate, sides widely rounded, widest at middle, anterior angles depressed and obtuse, posterior depressed and acute, evenly and rather closely punctate, with distinct medial depression terminating in a basal foveate puncture. *Scutellum* subcordate, minutely punctate. *Elytra* of same width as prothorax at base, lightly enlarged at shoulders, and compressed at middle, feebly attenuate behind and very minutely denticulate near apical margins; each apex minutely lunate and feebly bispinose. *Underside* minutely punctate and densely covered with short white pubescence. *Dim.*, 9 × 3 mm.

Hab.—Queensland: Endeavour River. Type in Macleay Museum.

A pretty little species, of which there are two examples in the Macleay Museum, the type female, the other possibly male. The elytral pattern is somewhat as in *coccinata*, Hope (*elegantula*, White), but *titania* is narrower, with prothorax differing in form and colour; nor has it the strong apical spines of that species. Hope's insect, moreover, has a yellow underside. It is perhaps nearest *unicincta*, Saund., in colour scheme, with a differently shaped base of elytra and additional markings. Otherwise I know nothing amongst the smaller species of the genus at all near it. The yellow margins of the prothorax are unusual in their outline, somewhat as in *notaticollis*, above, but the yellow area is proportionately much larger.

Stigmodera pulchella, n. sp.

Pl. x., fig. 33.

Oblong, attenuated behind. Head, antennae, prothorax, and elytra dark-blue, the last with pale-yellow markings as follows: two large round spots near base, two large antemedian pear-shaped spots situated behind the former (the pear stalk directed upwards), a lateral ovate-triangular spot placed on each side between the other spots, and an arcuate anteapical fascia extending to the sides, but not to the suture; underside and legs a rich purple-blue.

Head excavated and canaliculate, closely and evenly punctate. *Prothorax* globose, the apex feebly, base strongly bisinuate, the middle lobe rounded and pronounced, sides well rounded, widest at middle; disc closely and regularly punctate, a smooth medial line faintly indicated on basal half, all angles a little produced, depressed, and wide. *Scutellum* subcordate, concave, and punctate. *Elytra* widened behind shoulders and again behind the middle, sides not at all serrated, apex lunate and bispinose, the internal spine minute,

the external prominent; punctate-striate, intervals nearly flat and closely and finely punctate, basal border raised and produced to form a short carina near scutellum. *Underside* densely and finely punctate, almost glabrous. *Dim.*, 8 × 2·5 mm.

Hab.—Queensland. Type in the National Museum, Melbourne.

Two specimens (the sexes) from the French Collection in the Melbourne Museum are merely labelled Queensland. The species is near *gentilis*, Kerr., in size, form, and markings, except that in *gentilis* the basal spot is produced laterally, while in *pulchella* the three antemedian spots on each elytron are quite separated and clearly defined, while the hind fascia is not widened and sanguineous on the margin as in *gentilis*, and the apical lunation is more oblique, with the external spine more prominent.

STIGMODERA LEAI, n. sp., or var.

Pl. x., fig. 34.

Oblong, entirely peacock-green or blue, except the elytra, this with a latero-humeral spot, and preapical arcuate fascia yellow, the last interrupted at the suture and produced backwards on the margins nearly to the apex. Sculpture, form, and size as in *cyanicollis*, Boisd. *Dim.*, 9 × 3⅕ mm.

Hab.—Tasmania: Huon River and West Coast. Types in A. M. Lea's collection.

Two species, male and female, of this pretty little species vary only in the shade of colour, one being distinctly blue, the other blue-green. It may only be a variety of *cyanicollis*, Boisd., differing from the well-known Victorian and Tasmanian var., *viridis*, C. and G., in the presence of the subapical fascia; but it certainly deserves nominal distinction.

STIGMODERA TINCTICAUDA, n. sp.

Pl. x., fig. 35.

Elongate-subcylindric, attenuated at apex. Head, prothorax, legs, and underside golden-green, elytra testaceous with apical third gradually suffused with red, antennae and tarsi coppery-bronze.

Head and *pronotum* strongly and evenly punctate; the former deeply excavated and channelled, the latter convex-arcuate at apex, strongly bisinuate at base, all angles slightly produced and acute, sides feebly arcuately narrowed from base to apex; disc with slight medial depression, terminating in a basal fovea. *Scutellum* cordate, depressed, and punctate. *Elytra* of same width as prothorax at base and two and a half times as long; punctate-striate, the alternate

intervals subcostate, all intervals minutely wrinkled, apex very finely bispinose, the spines black, external spine more evident. *Sternum* coarsely, abdomen less coarsely punctate, the latter with short white hairy clothing. *Dim.*, 6·5-8 × 2·5 mm.

Hab.—Western Australia: Yalgoo (H. W. Brown).

Two specimens sent by Mr. Brown belong to a species closely allied to *immaculata*, *mihi*, but clearly differentiated by the following differences—(1) form narrower, more convex, and attenuated behind; (2) pronotum less closely and more coarsely punctate; (3) seriate punctures smaller; (4) alternate intervals subcostate; (5) colour without sexual distinction, the apex strongly suffused with red, this gradually fading away towards the middle of elytra. Types in the author's collection.

STIGMODERA HIRUNDICAUDA, n. sp.

Pl. x., fig. 37.

Oblong-ovate. Head, pronotum, sternum, antennae, scutellum, and legs golden-green, elytra testaceous with narrow basal border and extreme apex narrowly blue-black, abdomen testaceous.

Head excavated and channelled between the eyes, evenly and closely punctate. *Prothorax* 4 × 3 mm., feebly bisinuate in front, more strongly so behind, convex, widest behind middle, thence arcuately narrowing each way, all angles a little obtuse; disc closely punctate, the punctures gradually diminishing in size from base to apex, with a raised smooth medial line near base. *Scutellum* arcuate-triangular, laevigate. *Elytra* of same width as prothorax at base and three times as long, rather flat and parallel for the greater part, then finely attenuated behind, posterior margins finely denticulate; each apex with a subobsolete sutural and a long external spine; striate-punctate, the striae containing series of well-marked round punctures, the intervals evenly and slightly raised, *even at sides and extreme apex*, and themselves finely punctate. *Sternum* coarsely, abdomen very finely punctate; underside glabrous. *Dim.*, 12·5 × 4·5 mm.

Hab.—Western Australia: Shark Bay. Type in collection of C. French.

A single male specimen is easily distinguished from its allies—*planata*, *mihi*, *moribunda*, Saund., *subpura*, Blackb., etc.—by the following combination:—Bright-green prothorax, pale-yellow abdomen, dark-blue apex, narrowly attenuate with the long external spine, and the rare character of evenly striate-punctate elytra with intervals symmetrically arranged, and evenly convex throughout.

STIGMODERA FESTIVA, n. sp.

Pl. x., fig. 38.

Ovate. Head, antennae, thorax, scutellum, legs, and underside bronze, the first and last of these with a bluish tinge; elytra testaceous with large round spot near each shoulder, postmedial fascia and round apical spot black, the fascia enlarged and rounded on suture, contracted and again enlarged on each side and extending to the sides, area between fascia and apical spot bright-red.

Head deeply excavated and lightly channelled between eyes; closely and evenly punctate. *Prothorax* arcuate at apex, strongly bisinuate at base, rather bulbous on each side, widest near base, thence shortly contracted to the obtuse posterior angles, more gently converging to the acute anterior angles; disc evenly and closely punctate, with distinct medial channel terminating in a basal fovea, two small fovea near middle of each lobe, and a larger depression near posterior angles. *Scutellum* triangular, depressed, closely punctate. *Elytra* wide and flat, of same width as prothorax at base, widening strongly at shoulders and again behind middle, posterior margins entire, each apex with short sutural and long external spine; punctate-striate, intervals nearly flat on centre, raised at sides and apex, and minutely punctate. *Prosternum* coarsely, the rest of underside rather finely and closely punctate and almost glabrous. *Dim.*, 10 × 4 mm.

Hab.—Queensland: Rockhampton. Type in collection of C. French.

A single female specimen examined belongs to the *mustelamajor*, Thoms., section, from its similar structure of thorax and the form of the elytra, though the apical spines are less divaricate. In pattern it approaches that of *brutella*, Thoms., with the addition of two large round shoulder spots. It is quite distinct from *disjecta*, Kerr., a narrower and more convex species, with the red apical region less intensified.

S. COERULEIPES, Saund.; var. MONTANA, n. var.

There is a variety of *coeruleipes*, Saund., which I have taken commonly at Medlow, Blue Mountains, and which only differs from the typical form in the presence of two additional oval postbasal yellow spots on the elytra, isolated and not continuous to the sides. These were compared by Mr. C. O. Waterhouse with Saunders' type, and returned with a note on this distinction. As this local variation appears to be constant, it is worth a name, and can be known as *montana*. I have the typical form from North Sydney.

Subfamily CHALCOPHORINI.

Amongst the material sent from the National Museum, Melbourne, occur three new species, which are described below, together with a new *Chalcotaenia* taken in some quantity by Mr. H. Brown. Of these, *Chrysodema subfasciata* is the first record of a genuine member of this genus from Australia, *Chrysodema saundersi*, Macl., proving to be a *Cyphogastra*.

Synonymy.—*Cyphogastra pistor*, C. and G. = *Chrysodema saundersi*, Macl.

I have examined the presumed type of *C. saundersi* in the Macleay Museum, though, as usual with Macleay, it is not specially marked as such. There are also four specimens similarly labelled in the Masters Collection in the same Museum. They are all identical with *Cyphogastra pistor*, C. and G., except for slight individual differences incidental to all the species in this subfamily.

I have specimens of *Chrysodema aurofoveata*, Guér., from Banks Island, Torres Straits. It is, therefore, extremely likely to occur on the mainland, but I have not seen any other specimens besides those in my collection.

Chrysodema subfasciata, n. sp.

Pl. ix., fig. 2.

Elongate-ovate. Above blue-black with green or coppery impressions (in fresh specimen covered with yellow or orange flocculence), underside green or coppery, more or less obscured by yellow flocculence, legs and tarsi blue, antennae with three basal joints blue, the rest reddish.

♀. *Head* with triangular excavation on front, medial sulcus fine at base, deep on excavate portion; the raised parts irregularly punctate, epistoma with triangular excision at apex; antennae not quite extending to base of prothorax, third joint cylindric, as long as first, four-eleven subtriangular. *Prothorax* bisinuate at apex, feebly so at base, middle lobe of apex advanced and subtruncate, sides nearly straight, feebly sinuate near hind angles, all angles acute, the anterior depressed, posterior slightly produced; disc with a slightly raised medial convexity bounded by a rugose sulcus on each side, an oblique flocculent impression partly following the front margin of anterior angles, and an oval patch behind this near the middle of each lobe; the smooth raised parts sparsely punctate, the sides rugose-punctate. *Scutellum* round, convex, smooth. *Elytra* subangularly widened at shoulders, sides nearly straight on anterior two-thirds, thence

narrowed behind; each apex with a fine sutural tooth, the posterior margins with about ten coarse serrations; disc vaguely striate-punctate near middle, scarcely costate, the convex intervals obscurely costate only near apex, the sulci between these showing some regular longitudinal series of large punctures, a wide sulcus inside the margins, and the following flocculent impressions: three small basal, four at margins (a circular one behind each shoulder extended forward along the marginal sulcus, and a large arcuate subfasciate postmedian patch on each elytron), and three linear subapical patches, lateral patches with darker yellow flocculence than the others. *Prosternum* sulcate, the walls of sulcus carinate; mesosternum widely concave, metasternum with narrow suture, the last two showing sparse punctures; first segment of abdomen with convex plate, slightly hollowed in the middle through the presence of series of deep elongate punctures, the second segment containing even larger elongate punctures, the apical segment with a feebly-raised medial carina, the greater part of underside obscured by yellow flocculence. *Dim.*, 29 × 10 mm.

Hab.—North-western Australia: Roebourne. From C. French's Collection in National Museum.

♂. What I take to be a male of the above is a badly abraded specimen, the yellow flocculence scarcely evident, the impressions on upper-surface and the greater part of the underside coppery; the upper-surface is darker, nearly black, the large subfasciate elytral impression produced backwards on marginal sulcus, elytral intervals more costate behind, prothorax wider and feebly arcuate on sides. *Dim.*, 34 × 12 mm.

Hab.—North-western Australia: Roebourne. From C. French's Collection in National Museum.

I believe the above to be the sexes of the same species, the main characters of structure and markings being the same. The female specimen was selected for close description, being a fresh specimen in good condition, while the male specimen is obscured and abraded by age or treatment. The fresh specimen shows a mixture of green and blue colour, while the older specimen is blue-black, with pronounced coppery markings. The semiseriate arrangement of elytral punctures is exceptional, at least in Australian species of the *Chalcophorites*. Types in the National Museum, Melbourne.

This is the first record of this genus from Australia, though I have specimens of *auroforeata*, Guér., from Banks Island, Torres Straits; *saundersi*, Macl., belongs to the genus *Cyphogastra*, though described as *Chrysodema*.

CHALCOTAENIA CASTANEA, n. sp.

Pl. ix., fig. 1.

Widely navicular. Above nitid-castaneous, head and pronotum with iridescent, coppery, and violet reflections, apex of elytra with faint greenish reflections; head, depressions on pronotum and elytra filled with yellow pubescence, antennae reddish-coppery; underside and legs coppery, with white short pubescence.

Head, forehead concave, concavity broadened by rugose ridge, sulcate in middle, a small shining nodule on each side of sulcus, finely punctate at base. *Pronotum* trapeziform, feebly rounded at sides, anterior angles rounded, posterior acute, longitudinally sulcate in middle, and two wide longitudinal depressions, rest of surface irregularly rugose-punctate with smooth spaces near middle. *Scutellum* fiery-coppery. *Elytra* of male of same width as of female, considerably wider than prothorax at base, sides sinuately compressed behind shoulder, strongly serrated towards apex, with five wide and little-raised costae (including the sutural), the first, second, and fifth continuous throughout, the third starting from middle and joining the second towards apex, the fourth abbreviated, extending from humeral callus to halfway; a wide irregular depression extending from base to the starting-point of the third costa and expanding at base, the depression between the fourth and fifth costae widening at the apical third, the raised parts sparsely punctate. *Metasternum* coarsely rugose-punctate, prosternum and mesosternum much less so; abdomen with longitudinal nitid space sparsely punctate towards size, besides the nitid central costa, last segment of male with small irregular excision, of female apex produced into two blunt lobes. *Dim.*, ♂, 22 × 8 mm.; ♀, 29 × 10 mm.

Hab.—Western Australia: Cue (H. W. Brown).

Another of Mr. Brown's captures in this prolific region, and strikingly different from all described species in colour alone. The sculpture of the upper-surface is more irregular than in other species of the genus, being without well-defined pubescent spots, the usual position of these being merely indicated by enlargements of the longitudinal depressions, while the costae are only clearly carinate towards the apex. The apical process of the female is unusual. Type in the author's collection.

PSEUDOTAENIA SPILOTA, n. sp.

Pl. ix., fig. 3.

Elongate-oval, robust. Head, sternum, and margins of abdominal segments coppery, pronotum and elytra dark-blue

with violet reflections, having white or golden impressions; underside and femora chiefly coppery-purple, the flanks of sternum and whole abdomen dotted with various-sized tomentose impressions; antennae, tibiae, and tarsi blue.

Head channelled and triangularly excavate, with wide irregular rugose sulci on each side of excavation, and some smooth spaces and finer punctures between the eyes; epistoma rugose with triangular excision in middle of front margin, antennae with joints three-eight subequal (apical joints wanting). *Prothorax* 9 × 12 mm., moderately convex, feebly bisinuate at apex, more strongly so at base, all angles acute, the posterior the wider (about 80°); widest at base, sides slightly sinuately narrowing to apex, extreme edge irregularly crenulate; disc with wide smooth medial convexity, with narrow sulci on each side of this terminating in a rugose space towards front angles, and three large depressions near margins (one near posterior angle) and smaller round foveae, irregular in size on other parts of disc. *Scutellum* small, transverse, biglobose, and smooth. Elytra wider than prothorax at base, basal margins strongly wrinkled, widest behind middle, margins sulcate within on basal half, becoming explanate near middle, strongly serrated posteriorly; apices with distinct sutural tooth and about seven small teeth on posterior serration; disc with four subobsolete costae, the first sutural, the second parallel to the first for the greater part, diverging towards the base, between these costae irregular rows of golden foveate depressions more or less clothed with white flocculence, those between the first and second costae elongate, those between second and third large, round, and distant, those between the third and fourth smaller and closer; a wide golden vitta occupying the space between the fourth costa and the margin, starting from the shoulder and terminating near apex, a few small punctures sparsely scattered on the smooth spaces round the humeral swelling. *Prosternum* saddle-shaped, with a few large punctures, mesosternum and metasternum and first abdominal segment channelled; the whole underside, except the smooth central parts, dotted with large irregular golden impressions, clothed with white recumbent hair, each segment of abdomen with a similar impression at the sides. *Dim.*, 46 × 16 mm.

Hab.—Western Australia: Shark Bay.

A single female specimen from the French Collection in the Melbourne Museum is quite different from all described species, and may be readily distinguished by the combination of large size, violet-blue colour, slightly-raised costae, wide marginal vitta, and irregularly spotted surface. Type in the National Museum, Melbourne.

CYPHOGASTRA QUADRIVITTATA, n. sp.

Pl. ix., fig. 4.

Elongate-navicular. Upper-surface green, somewhat cyaneous on the raised parts, with lighter-coloured impressions, more or less filled with yellow flocculence; underside coppery on raised central part, green more or less obscured by yellow flocculence elsewhere; legs green (antennae and tarsi wanting).

Head triangularly excised, channelled at base, with a deep central fovea between the eyes, these bordered within by rugose-pustulose ridge; basal part sparsely punctate near middle, rugose-punctate behind eyes. *Prothorax* 8 × 11 mm., depressed, strongly bisinuate at apex and base, all angles produced and acute, base with widely-rounded central lobe, widest at base, sides sinuate near both angles; disc with wide deep medial sulcus, a wide irregular flocculent impression, trilobed externally, occupying the greater part of sides, the raised part near centre sparsely punctate, at sides rugose-punctate. *Scutellum* rounded and depressed in front, bilobed and convex behind, with four punctures on anterior half. *Elytra* slightly wider than prothorax at base, angularly widening at shoulders and tapering to an acuminate apex from the middle, each apex subrectangular at suture, with about four strong serrations on posterior margins, each elytron with two wide impressed vittae, golden-green with yellow flocculence (where not abraded), the first extending from base to near apex, near and more or less parallel to the suture, the second near the margin starting behind the shoulder and extending to the apex, a large floccose impression at base near the middle of each elytron, a narrow lateral sulcus exterior to the second vitta starting from the posthumeral sinuation, and gradually widening and obsolescent towards apex, the suture convex on anterior half, narrowing and carinate posteriorly, with fine sparse punctures, the raised surface between the vittae having larger and more regular punctures, these gradually becoming obsolete towards apex. *Prosternum*, mesosternum, and metasternum widely sulcate; first abdominal segment with the usual convex plate at centre, rounded behind, acuminate in front, the smooth middle parts of underside finely and sparsely punctate, the greater part of the under-surface covered with orange-yellow flocculence. *Dim.*, 40 × 12 mm.

Hab.—Western Australia: Carnot Bay.

A female specimen from the French Collection in the Melbourne Museum is the finest and most distinct species of the genus known to me. It may be at once differentiated

from the other described Australian species by (1) greater size, (2) by the four elytral vittae extending nearly the full length. Type in the National Museum, Melbourne.

EXPLANATION OF PLATES.

Plate IX.

Fig. 1. *Chalcotaenia castanea*, Cart.
,, 2. *Chrysodema subfasciata*, Cart.
,, 3. *Pseudotaenia spilota*, Cart.
,, 4. *Cyphogastra quadrivittata*, Cart.
,, 5. *Stigmodera porosa*, Cart.
,, 6. ,, *gigas*, Cart.
,, 7. ,, *barbiventris*, Cart.
,, 8. ,, *gloriosa*, Cart.
,, 9. ,, *imperialis*, Cart.
,, 10. ,, *rufocyanea*, Cart.
,, 11. ,, *franca*, Cart.

Plate X.

Fig. 12. *Stigmodera blackburni*, Cart.
,, 13. ,, *alexandri*, Cart.
,, 14. ,, *rufolimbata*, Cart.
,, 15. ,, *browni*, Cart.
,, 16. ,, *desideria*, Cart., female.
,, 17. ,, ,, male.
,, 18. ,, *neglecta*, Cart.
,, 19. ,, *propinqua*, Cart.
,, 20. ,, *pisciformis*, Cart.
,, 21. ,, *argillacea*, Cart.
,, 22. ,, *serratipennis*, Cart.
,, 23. ,, *maculicollis*, Cart.
,, 24. ,, *haswelli*, Cart.
,, 25. ,, *lepida*, Cart., female.
,, 26. ,, ,, male.
,, 27. ,, *octocostata*, Cart.
,, 28. ,, *sexnotata*, Cart.
,, 29. ,, *attenuata*, Cart.
,, 30. ,, *planata*, Cart.
,, 31. ,, *acuticollis*, Cart.
,, 32. ,, *titania*, Cart.
,, 33. ,, *pulchella*, Cart.
,, 34. ,, *leai*, Cart.
,, 35. ,, *tincticauda*, Cart.
,, 36. ,, *notaticollis*, Cart.
,, 37. ,, *hirundicauda*, Cart.
,, 38. ,, *festiva*, Cart.

Notes on the Lord Howe Island Phasma, and on an Associated Longicorn Beetle.

By Arthur M. Lea, F.E.S., Museum Entomologist.

[*Contribution from the South Australian Museum.*]

[Read June 8, 1916.]

Plates XI.-XVII.

One of the most remarkable species of insects that I obtained during a recent (December, 1915, and January, 1916) visit to Lord Howe Island, is a large wingless phasma, *Karabidion* (formerly *Eurycantha*) *australe*, Montr. It appears to have been taken by almost every natural history visitor to the island, and, in fact, once their hiding-places are known, specimens may be taken in practically unlimited numbers. During the day they remain concealed in hollows in upright or slightly-sloping stems of living trees, but their presence may be detected by examining the ground at the foot of the trees, where heaps of their excrement, sometimes amounting to bushels, may be found. The hollows are seldom less than eighteen inches in length, and are sometimes much longer; suitable ones are probably used for years. On examining the heaps of droppings, frequently both fresh and newly-hatched eggs may be found, the females apparently simply extruding their eggs as soon as these are ready.

Occasionally during daylight, when beating shrubs over an umbrella for insects, a newly-hatched larva, usually green, would drop into it; but except for these I never saw a specimen at large during daylight. They appear to come out late at night and to climb the trees directly for food. In the hollows considerable numbers live together in all stages, but with immature forms in the majority; from one hollow that was completely emptied sixty-eight specimens were taken; in the same hollow were several large spiders and cockroaches. The males are armed with formidable spines on the hind femora, and when being captured they attempt to use these in conjunction with the strong curved tibiae; the females simply try to escape.

The females vary comparatively little in structure, except that when mature the smallest is not quite four inches in length and the largest is a little over five inches. The males, however, vary considerably, especially in the hind legs; the smallest in the Museum measures nearly three inches, the

largest about four and a half inches. The hind femora on the small males have armature not much more pronounced than on the females, but on the large males the two large teeth are very strong, and there are up to twelve smaller ones; the femur itself on the large males is considerably wider than the abdomen, and passes the sixth segment of the latter; whereas on the small males it is narrower than the abdomen, and may not extend to the tip of the fourth segment.

Six specimens (all males) were taken, on which, a leg having been lost, it had been renewed; four of these were larvae, and the renewed legs are very small (pl. xiii., figs. 5-8). On the two mature specimens (pl. xiv.) the renewed leg is a hind one, and it is remarkable that with each the leg, in addition to being much smaller than the non-renewed one, is without conspicuous masculine armature, approaching the female type.

I saw no communities in dead trees, but was told that occasionally when a tree touched a house, and especially in the olden days when many houses were thatched, the phasmas would frequently take shelter in large numbers in the ceiling and make uncanny noises at night. But they were easily checked from doing this by preventing any part of the adjacent trees from touching the house. In nearly all cases that I examined it was seen plainly that the phasmas had selected for their domicile trees that had been largely bored by larvae of a large longicorn beetle.

This beetle, *Agrianome spinicollis*, W. S. Macl.,[1] is abundant on the island, and numerous specimens may be taken at night on the trunks of many kinds of trees. The larvae make large borings and eject most of their excrement outside the trees; each makes a large hollow, and as many usually work together their borings frequently interlace; in time, with the work of other insects, timber-rotting fungi, etc., large hollows are formed, and in these the phasmas take up their residence. A large orange tree was practically destroyed by larvae of this beetle, and figures (pl. xvii.) are given of the inside and outside appearance of portion of the trunk of this tree, showing the great damage done. Large *Kentia* trees are also attacked. No living banyan trees were noticed to be attacked by it, but larvae were abundant in dead ones. Very old and rotten logs of many kinds of trees appeared to be attacked with as much favour as living trees, and their larvae are often taken from such logs by the islanders, with whom they are very favourite fish-bait.

---

[1] It is not *Cnemoplites (Arimaspes) howei*, as the late Mr. A. S. Olliff thought possible.

Both sexes of the matured beetles vary in length, but the male may be readily distinguished from the female by its longer and stouter antennae and legs, especially the front tibiae and tarsi, pronotum with patches of coarse punctures alternated with more finely punctured and subopaque patches (instead of with coarse punctures throughout as on the female), and abdomen wider and subopaque, except that the fifth segment and tips of the others are shining; whereas on the female the abdomen is polished throughout.

EXPLANATION OF PLATES.(2)

PLATE XI.

Male of Lord Howe Island Phasma, *Karabidion australe*, Montr.

PLATE XII.

Female of Phasma.

PLATE XIII.

Figs. 1-8. Immature specimens of Phasma.
,, 5. Larva with renewed right hind leg.
,, 6 and 7. ,, ,, ,, left front leg.
,, 8. ,, ,, ,, right middle leg.
,, 9. Eggs.

PLATE XIV.

Two mature males with right hind legs renewed.

PLATE XV.

Sections of tree inhabited by Phasmas (greatly reduced).

PLATE XVI.

Longicorn Beetles, *Agrianome spinicollis*, W. S. Macl.

PLATE XVII.

Sections of orange tree damaged by Longicornes (greatly reduced).

(2) Photographs by Mr. Henry Hale, of the South Australian Museum.

Hyalostelia Australis, the Anchoring Spicules of an Hexactinellid Sponge from the Ordovician Rocks of the MacDonnell Ranges, Central Australia.

By R. Etheridge, Junr., Curator, Australian Museum, Sydney, Honorary Fellow.

[*Contribution from the Australian Museum.*]

[Read July 13, 1916.]

Plate XVIII.

In 1900 a small collection of MacDonnell Ranges fossils was presented to the Australian Museum by the Department of Mines, Adelaide. Amongst these was a small piece of red fossiliferous quartzite, the weathered surface covered with minute straight, white, rod-like bodies, and the same showing in section on the fractured ends of the entire mass. This at the time was put aside for further examination, and, as so often happens in such cases, forgotten.

These white, apparently rod-like bodies I take to be the anchoring spicules of an Hexactinellid Sponge, and referable to the genus *Hyalostelia*, Zittel (=*Pyritonema*, McCoy [1]).

The existence of these spicules had already been recognized in the rocks of the MacDonnell Ranges. At the annual meeting of the Society, on October 17, 1893, Mr. W. Howchin [2] "exhibited a fossil sponge, *Hyalostelia*, from the Lower Silurian rocks of the MacDonnell Ranges, forwarded by Mr. Thornton, of Tempe Downs. The only other site where it is known to occur in South Australia is in the Cambrian rocks at Curramulka."

Professor R. Tate briefly referred in his account of the Horn Expedition fossils to the occurrence of sponge rootlets in quartzite at Finke Gorge. He described [3] them as cylindrical casts, 1·5 mm. in diameter, extending through a vertical thickness of four inches. Notwithstanding these

(1) McCoy: Ann. Mag. Nat. Hist., vi. (2), 1850, p. 273.

(2) Howchin: Trans. Roy. Soc. S. Aus., xvii., pt. ii., 1893, p. 355.

(3) Tate: Report Horn Expdn. Central Austr., pt. iii., 1896, p. 113.

casts are larger than *Hyalostelia* rods proper, Tate yielded preference to a sponge view of their nature rather than regard them as Annelide burrows.

The cylindrical rods forming the specimen now before me, and which I propose to term *Hyalostelia australis*, have a variable diameter of 0·19-1·39 mm., the longest preserved piece measuring twenty millimetres. They are circular in section, and when the strong mineral alteration the rods have undergone allows the structure to be seen, it is concentric. In many an axial tube is still apparent. These spicular cables are quite free and unattached to one another, without any trace of "rope-like bundles," and although not all absolutely parallel to one another, lie more or less in one direction.

The matrix is a compact quartzite slightly iron-stained in colour, and the rods being white stand out in strong contrast.

As already stated, the spicular rods are siliceous like the matrix, but in places have undergone a secondary chalcedonic change, and when this is so all structure is obliterated, the alteration taking the form of bleb-like particles. Neither hooked-like terminations nor projecting decorative structures were observed.

The variation in the spicule diameter (0·19-1·39 mm.) is quite in keeping with that of the already-described species, *H. fasciculus*, McCoy, sp. (·15-·7 mm.). Dr. J. G. Hinde comments on this variability in the anchoring spicules of the above species,[4] which is met with in limestones of Llandeilo age; these also are converted into chalcedonic silica.

The diameter of the MacDonnell Ranges anchoring spicules, therefore, very considerably exceeds that of the British form, and will afford a ready means of distinguishing the two until the body of the sponge proper in *H. australis* is discovered.

As a matter of strict priority the name *Hyalostelia*, Zittel, 1878, should give place to that of *Pyritonema*, McCoy, 1850. Dr. Hinde, however, has retained the former, but in the English edition of Zittel's "Text-book of Palaeontology," by Eastman,[5] the two are separately maintained, *Pyritonema* being defined as "fascicles of long, stout spicules, supposed to be root tufts"; whilst in *Hyalostelia* the anchoring spicules are "root-tufts composed of elongated, slightly-bent fibres, sometimes terminating in four recurved rays."

Mr. Howchin was kind enough to lend me his specimen, when I found that it and the Museum example form portions

(4) Hinde: Mon. Brit. Foss. Sponges, pt. 2, 1888, p. 112.

(5) Vol. i., 1900, p. 55.

of one and the same piece of rock. When united the two pieces measure one and a quarter inches long, one and a half inches wide, and three-quarters of an inch thick, the spicular rods extending throughout.

I am indebted to Mr. Howchin for the following remarks [August 31, 1916]:—

"From the material in my hand I think there must be at least two clearly distinct species. Notwithstanding the inclusion of rods of different diameters in the same individual, there is, in all my examples, a certain preponderance of a given diameter in the rods of any one particular sponge. This also seems to be borne out by the descriptions and figures hitherto published. That is to say, in a certain number of cases the individual rods do not, throughout the entire specimen, attain a diameter of more than half that of the average size of other examples. The diameters of the respective species, as described, are as follows (Hinde's figures being used):—

Group I. (fine hair-like rods).	*Hyalostelia parallela*, McCoy, 0·2 to 0·5 mm. *H. (Pyritonema) fasciculus*, McCoy, 0·2 to 0·5 mm. *H. (Hyalonema) youngi*, Eth., junr. Described as "hair-like."
Group II. (stout rods).	*Hyalostelia australis*, Eth., junr., 0·19 to 1·39 mm. *H. (Hyalonema) smithii*, Y. and Y., 0·3 to 1·5 mm.

"It is true that *H. australis* (rods) do 'considerably exceed' in size those of *Pyritonema fasciculus*, but they are, if anything, a little smaller than those of *H. smithii*. The Tempe Downs example comes so near to the Carboniferous *H. smithii* that I regarded it as indistinguishable from that form, and for that reason did not define it as a new species."

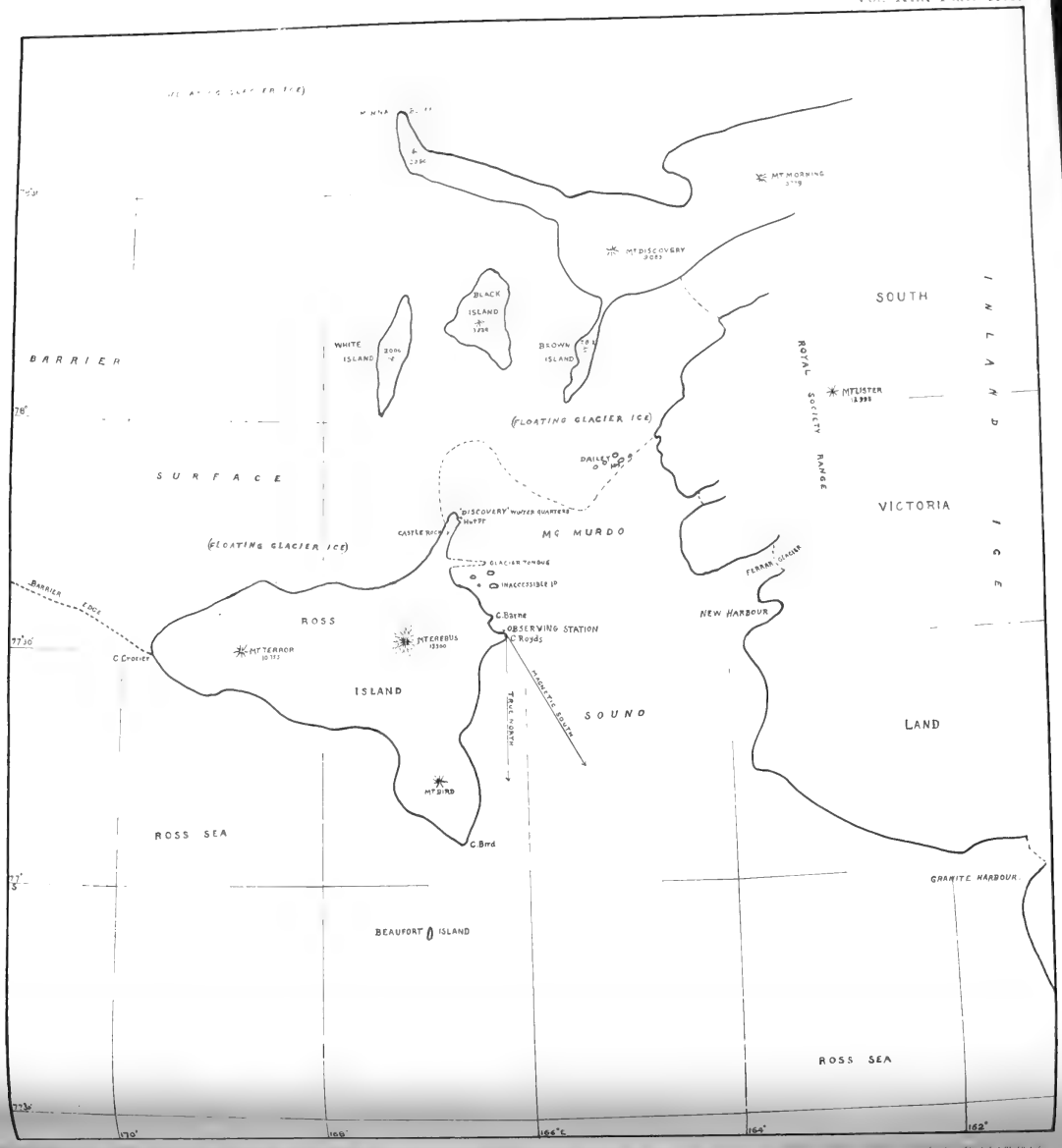
———

EXPLANATION OF PLATE XVIII.

HYALOSTELIA AUSTRALIS, Eth., *fils*.

Fig. 1. Transverse section of anchoring spicules—×4 diam.
,, 2. Longitudinal section of several spicules—×7 diam.

In both sections the dense black portions in the spicules are the silicified tissue; the white patches, on the contrary, are the blebs of chalcedonic silica. In the transverse section (fig. 1) some of the axial canals are visible (as at *a*), and again in a longitudinal section (fig. 2, *b*).


MT MINNA
MT MORNING
MT DISCOVERY
BLACK ISLAND
WHITE ISLAND
BROWN ISLAND
BARRIER
SURFACE
(FLOATING GLACIER ICE)
SOUTH
ROYAL SOCIETY RANGE
MT LISTER
VICTORIA
LAND
DAILEY ISLETS
DISCOVERY WINTER QUARTERS
HUT
CASTLE ROCK
MC MURDO
GLACIER TONGUE
INACCESSIBLE I.
FERRAR GLACIER
NEW HARBOUR
BARRIER EDGE
C. Crozier
MT TERROR
MT EREBUS
ROSS
ISLAND
C. Barne
OBSERVING STATION
C. Royds
MAGNETIC SOUTH
TRUE NORTH
SOUND
MT BIRD
C. Bird
ROSS SEA
GRANITE HARBOUR
BEAUFORT ISLAND
ROSS SEA
77°
78°
170°
169°
166°E
164°
162°

Auroral Observations at the Cape Royds Station, Antarctica.

British Antarctic Expedition, 1908.

By D. Mawson, K.B., D.Sc., etc.

[Read July 13, 1916.]

Plates XIX. and XX.

PREFACE.

The following notes were prepared for publication in the year 1911. The printing, however, was delayed, as Sir Ernest Shackleton expected to publish the Scientific Reports of the Expedition as a continuous series. Since then, want of the necessary funds has driven him to abandon the idea of a complete series, and this manuscript is at last released for publication.

The matter submitted is, firstly, the journal of aurorae observed, and, secondly, conclusions drawn from an analysis of the records contained therein. The journal is a compilation of all loggings entered by members of the party. In this almost everybody at the hut participated. One of the particular duties of the night-watchman was to scan the heavens at intervals for auroral phenomena. As the party contained few trained observers, the journal is not consistently thorough throughout. However, as I was responsible for that department of the work, I made it my business to personally observe every display possible between the hours of 8 a.m. and midnight; the night-watchman had standing orders to waken me at any time between midnight and 8 a.m., should there be any notable demonstration.

I wish to mention Professor T. W. E. David, Chief of Scientific Staff, as having been specially active in observations and loggings connected with this journal.

As the records of auroral phenomena noted by observers of the Australasian Antarctic Expedition of the years 1912 and 1913 were very full and supply much more matter for discussion than herein available, only more prominent conclusions will be referred to in this contribution. Later on the subject can be reopened in the light of the fuller information made available by the later expedition.

Adelaide University, January, 1916.

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I.—JOURNAL OF AURORAE.

1. Introductory Remarks.

All directions mentioned in the text are given as true and not magnetic bearings. The magnetic declination at Cape Royds was, approximately, 150° E. The time of the entries is stated in a daily round of twenty-four hours, beginning at midnight and ending with the following midnight. For example, 22.30 refers to 10.30 p.m. of the civil scale.

The hour entered was that of the hut clock, with necessary adjustments made at two periods of the year, on occasions when the clock was ascertained to be considerably in error in relation to local mean time. Unfortunately, those of the party in charge of the "time" were not as painstaking as they should have been, and so this record, though relatively accurate in itself, cannot be relied upon, within several minutes of time at least, for comparison with other stations.

The trend of bands in the sky was noted as frequently as possible, and the direction stated always the real trend, as if observed in the zenith; not the apparent trend as seen in perspective. In cases more than a few degrees from the actual zenith some experience is necessary to accurately determine such direction. As a rule, no attempt was made to log the trend of arcs of low elevation, on account of uncertainties entailed therein. Arcs extending straight across the zenith

from horizon to horizon, as they drifted away from the zenith, always appeared, on account of perspective, to become bowed with convexity away from the observer. This and other optical effects had at all times to be carefully borne in mind when recording the trend of fragments of arcs at a distance from the zenith.

It is certain that many faint auroral phenomena escape observation altogether, except at the hands of an experienced observer. Often when the luminous phenomena have so faded as to be invisible to the eye in the normal way, something may still be seen by looking towards a point 60° or 90° away and then staring sideways. By doing so the focus is thrown upon a fresh (more sensitive) portion of the retina.

Reference in the text is frequently made to topographical features of the locality about Cape Royds, the observing station. The position of these can be noted by reference to plate xix. (facing page 151).

2. Explanation of Terms employed in the Text.

The manifestations recorded as aurorae are luminous phenomena of diverse form resembling closely the appearances produced by electric discharge in rarified gases. The accumulated labours of contributors to this subject show that the incandescence observed in auroral displays is due in some way to electric disturbances in the higher rarified atmosphere.

In logging the manifestations a number of types have been recognized and agreed upon by various authors. The majority of the contributions to the literature of the subject, however, have not been sufficiently scientific, and published works are overloaded with a redundancy of terms, often overlapping and ill-selected. In this place, a discussion of the subject will not be attempted. It will suffice to explain what is meant by the terms actually used in this journal.

Curtain.—This is the idealized form of aurora phenomena, and contains all the elements of auroral manifestations. Curtains are in the form of somewhat convoluted (draped) bands and bars across the sky. Like the article of furnishing from which they take their name, they are narrow in lateral width, but the vertical extension is always considerable. A fine illustrative example, though somewhat more than usually convoluted, is that figured by Dr. Wilson as plate 10 in the Aurora Report of the British National Antarctic Expedition of 1902-1904. The elements of a curtain are vertical filaments, or *streamers*, as they are referred to in this journal. The streamers are arranged just

as are the teeth in a comb, when the latter is held vertically with the back of the comb below. At the lower edge of a typical curtain the streamers are all united to form a continuous ribbon of light at an even altitude above the surface of the earth; above they fade into invisibility at varying altitudes, imperceptibly passing into outer darkness. In cases where the display is fainter, only the brighter sections of a curtain may be visible, and the relation of such patches of light in the heavens only become manifest at intervals when the excitation increases and the intervening portions of the curtain become dimly outlined. Often all that is visible is one or two isolated streamers which experience has taught are, in most cases at least, the visible parts of an invisible curtain, if one may so express oneself. Curtains, as they are viewed, wax and wane—now dazzling bright and again quickly fading to almost invisibility. The excitation travels definitely from one end to the other, often in slow, pulsating movements. In the case of intense displays, however, the luminescence ripples in a kind of wave-motion through the streamers from one end to the other. In addition to the passage of luminescence along the length of a curtain, the whole curtain usually shows a tendency to drift *(body-travel)* towards some quarter of the heavens. Curtains seldom appear singly, but more often multiple, usually as strictly parallel forms, in number proportionate to the intensity of the aurora. Very brilliant curtains usually reduce themselves within a few minutes to a nebulous condition, in which the streamers and all fine outline are lost in a broad incandescent (nebulous) band or arc. Nebulous *bands*, *arcs*, and *patches* are commonly referred to throughout this journal.

Brilliant aurorae below the horizon may cast a reflection on and so illuminate the borders of visible clouds, producing an auroral glow. Our observations show that at other times there was the appearance of auroral excitation connected with specific clouds.

The term *corona* is not employed here, for in literature it is, often at least, misapplied. The streamers of curtain rings, when such are situated in the zenith, on account of perspective effect, appear to converge to a meeting-point above, and so have often been referred to in literature as a special form under the name of corona. Elsewhere in contributions on the subject of the aurora polaris the term is employed to refer to manifestations when an intense display reaches the zenith.

The term *arch* is, except perhaps in exceptional cases, a misnomer, as extensive linear bands are of the nature of arcs at a fairly uniform height above the surface of the earth.

3. Journal of Aurorae

observed at

Cape Royds, Ross Island (Lat. 77° 32′ South, Long. 166° 12′ East), during 1908.

March, 1908.

26th,	4.00	An auroral streamer on the S.E. horizon.

April.

3rd,	24.00	Streamers from E.N.E. to S.E. near the horizon.
4th,	2.00	Auroral streamers again noted.
	16.00	Streamers over N.E. and S.W. horizon.
	24.00	Curtain to E.
6th,	22.00	Curtain behind Ross Island extending from N. to S.E. by E. Fine snowfall from no visible cloud at 23.00.
7th,	2.00	Four arcs extended overhead to N. and S., situated in the sky to E. of zenith. Also streamers appeared over the horizon.
	4.00	Aurora again noted; partially obscured by nimbus clouds near the horizon. Slight haze with fine snow between 2.00 and 4.00.
12th,	21.00	Two streamers seen in the E.
13th,	2.00	Curtain trending to the N.W.
20th,	23.00	Curtains stretching N. and S. across the sky to E. of zenith. The moon well up, and so the auroral light must be strong to be visible.
	24.00	Streamers in the N.
21st,	21.00	Beams over the slopes of Mount Erebus, to the N.E.
	22.15	Four parallel bands across the sky from the zenith to the E., trend somewhat E. of N. The light is strong, notwithstanding the brightness of the moonlight.
	24.00	Streamers and low arcs from N. to S. on the E. horizon.
22nd,	2.00	Aurora continues in the E.
	4.00	Aurora continues, but fainter.
25th.		Streamers arising from the N.E. horizon, noted on the next succeeding days when clear between 17.30 and 18.30. Stronger lights, usually as arcs, show up between 22.00 and 2.00.
	23.00	Aurora bright from N. to E.
26th,	22.00	Aurora in N. and E.
	24.00	Aurora in N.E. to S.
27th,	2.00	Aurora reported in N.E. and S.
	4.00	Aurora reported in N.E. and S.
	22.00	Auroral phenomena appeared in the S. and S. by W.
	23.30	Almost the whole sky from N. by W., through E. to S., ablaze with auroral bands, curtains, and nebulous masses. The luminous masses appear to travel rapidly in a definite direction. The forms are ever changing, retaining their shapes for not longer than 10 seconds. The nebulous masses have the appearance of being very near the earth's surface. This evening, and several preceding evenings, the bands trended in a distinctly more E. and W. direction than on earlier occasions.

28th, 00.30 The brilliant auroral display continues. A splendid curtain. Auroral lights occupy the heavens E. of the zenith from S. to N.N.W.

2.00 Several curtains to the N. and N.N.W.

May.

1st, 2.00 Curtain S.E. of zenith extending from S. to E.

4th, 22.00 Auroral lights seen faintly near the zenith.

24.00 Zenith clear, lower sky obscured.

5th, 22.00 Aurora noted low down to S.S.W. A marked absence of aurora for some time, though the sky remained clear.

22nd, 3.00 Faint aurora noted between 3 a.m. and 4 a.m.

20.00 Faint aurora becoming stronger later in the evening.

22.00 Stronger and more brilliant illumination.

23rd, 2.00 Bright aurora.

11.00 A remarkable arc observed under twilight conditions. It was located in same position as most aurora appeared last evening, namely, extending from somewhat W. of S. over the zenith and to the E.N.E. It diminished in distinctness to the N. and to the S. of a point some 30° S. of the zenith. Visible for half an hour.

20.00 Aurora observed to the N.E. Beams rising above the horizon. A heavy cloud, due to sea smoke, hanging over McMurdo Sound showed a brilliantly illuminated edge, which appeared to be other than a reflection of a distant aurora or the moon.

22.00 A curtain extended on the E. side of Mount Erebus from just S. of the mountain to the N. horizon. Brilliantly illuminated below and shading off above into long streamers. As it extended past the cone of Mount Erebus, there appeared a local bend, curving outwards from the mountain. Viewed from the hut the lower border appeared to show below the summit of the mountain, and this, in conjunction with the apparent local influence of the latter in developing a kink may be regarded as indicating a comparatively low altitude for the phenomenon.

24th, 3.00 Bright aurora.

4.00 Ditto.

15.00 Curtains extending from E. to W. over the zenith.

16.30 A strong blaze of light coming from the E. of Mount Erebus and shooting long vertical streamers up into the sky.

17.30 } A brilliant and remarkable curtain trending N.N.E.
18.15 } to the vicinity of Mount Erebus, then sweeping to the E. almost at right angles and continuing in an E. and W. direction over the Ross Sea. The phenomena appeared to be situated at a low elevation. The luminescence travelled rapidly from E. to W.

21.30 Auroral lights continued to illuminate the sky until now. Then intervened a short period during which there was a noticeable absence of aurora.

24.00 Aurora observed near the horizon from N. to E.

25th,	2.00	Aurora same as observed at midnight.
	4.00	Aurora still observed, but concentrating more to the S.
	8.00	Faint in the N. and N.E. No display noted during the middle of the day.
	17.00	A remarkable nebulous arc extending from E. to W. over the hut; streamers absent. A second parallel arc is faintly outlined.
	18.00	Auroral streamers rising above the highlands of Ross Island and continuing steadily.
	20.30	A remarkably fine display extending in a N. and S. direction along the length of Ross Island. For half an hour a definite symmetry was observed in relation to Mount Erebus. Part of this time it was of the nature of a complete circular investment, and appeared to have a diameter of some 20 miles. It was not truly circular, exhibiting more the outline of Ross Island.
	21.15	The aurora still good, but much diminished in brilliance.
	22.15	Very faint aurora.
26th,	21.15	Faint streamers appearing over the highlands of Ross Island. Luminous-edged clouds to the S.E.
27th,	2.00	Auroral lights from zenith to the E.
	4.00	Ditto.
30th,	2.00	The sky previously obscured began to clear, and a faint aurora was noted along the highlands of Ross Island both N. and S. of Mount Erebus.
	4.00	An auroral arc to the N.
	8.30	The illumination, which had continued since previously noted, travelling more to the N., now waned.
	9.30	An illuminated border appeared very distinctly on the condensation clouds over Ross Island.
	17.30	A curtain of streamers rose from the highlands of Ross Island extending from Mount Erebus southwards. The streamers were very strong, and extended to a great height. As usual, united below to form a uniformly illuminated selvage. In this particular case the lower border of the curtain appeared to ascend to a higher altitude as it passed over the cone of Mount Erebus. The excitation travelled particularly rapidly to-night.
	18.00	A condensation cloud drifting from the N. showed, when S. of Mount Erebus, a bright luminous edge. The illumination increased, and a few minutes later auroral streamers extended upwards from the cloud edge, and were noted as far S. as Hut Point. Other clouds in the sky did not show luminous edges. Later on other clouds showed an auroral glow with streamers rising from their upper surfaces. During this time no curtains crossed the cloudless portions of the sky.
	18.30 to 22.00	The sky obscured, but auroral glow perceptible through breaks at intervals. In particular there appeared one long arc.
	24.00	Faint aurora to S.E. by E.

31st, 4.00 Auroral phenomena in the N.N.W. to E. by S.E.
8.00 Aurora in the E.
8.45 Long nebulous auroral arcs, uniformly illuminated, extended along the highlands of Ross Island. The luminescence shaded off towards the border of the bands. This is the first appearance of this definite type of aurora. In other parts of the sky a dull auroral glow appeared.
20.00 A most striking auroral curtain ran along the highlands in a more or less N.N.W. direction. It appeared to be very low over Mount Erebus and to touch the present active crater. At one stage it ringed the crater of Mount Erebus. For the space of about four minutes it appeared strongly coloured; the colour bands were horizontally stratified, red below, passing upwards through yellow, greenish-white, and purple to blackness above. The excitation producing the colour travelled S. from the direction of Cape Bird towards Mount Erebus. The arc as a whole appeared to travel to the N.
20.20 The arc still faintly red below.
21.00 Absence of auroral phenomena.

June.

1st, 2.00 A brilliant display in the form of curtains, streamers, and nebulous masses covered the sky E. of the zenith from N. to S.W.
2.30, 3.00, 4.00, 4.30, 5.00 Aurora distributed generally over the portions of the sky to the E. of the zenith from N. to S.W.
6.00 Long streamers in the N.N.W. A luminous haze continued faint during the day, and appeared stronger in the evening.
2nd, 2.00 An aurora near the S.E. horizon.
4.00, 8.00 Aurora in the E.
12.00 Faint aurora on horizon N. of Mount Erebus.
15.15 A faint auroral arc extended nearly E. and W. over the zenith.
16.00 A single strongly-defined curtain extended somewhat N. of W. over the zenith. This followed a straight line over the ice of McMurdo Sound, but in the vicinity of Ross Island curved to the N., so as to bring its course directly over the summit of Mount Erebus.
3rd, 16.30 A nearly E. and W. auroral band crossed the heavens exactly as noted at this time yesterday. It continued eastward as far as the eye could reach. A less strongly marked band extended from the N. horizon towards the zenith.
20.00 A bright glow, resembling an auroral haze, extended round the horizon.

4th, 1.15 A brilliant auroral display concurrently with mild blizzard conditions. An intensely illuminated curtain formed the main part of the aurora and stretched across the zenith, trending N.W. For a short period a red selvage appeared below. Ripples of luminescence travelled from end to end at a wild and rapid pace. When the excitation travelled more slowly and in a more concentrated fashion the jerky effect noted is best described as a pulsation. The building up of the curtain by vertical filaments, exactly as the teeth are arranged in a comb, was well illustrated. As the exciting cause traversed the length of the band in a horizontal direction it caused a kindling along a median zone, and this was followed quickly by a vertical travel of the exciting cause, both upwards and downwards, along the filaments. In the case of the downward travel, it strongly reminded one of the shower of descending light produced by the explosion of a rocket occurring at its maximum altitude. The upward kindling was similar, but of course inverted. This particular curtain remained strongly illuminated for 10 minutes; it then faded, and had disappeared in 30 minutes. Other parallel curtains traversed the heavens, and all, towards their southern extension, showed curvature to the E. Besides the rippling luminescence referred to, there was distinct and rapid bodily drift to the N.W. We watched a beautiful parabolic form develop just south of the zenith. The luminescence first appeared at what afterwards formed the apex which was at the southern end; the axis of the parabola pointed S. by E. from the zenith. Very soon the whole became an ill-defined nebulous mass, and drifted away rapidly to the N.W., as if impelled by the blizzard wind. The whole display lasted only about an hour, and was noted no more all night.

9.45 The wind now rapidly fell and a well-defined auroral arc developed overhead, appearing to trend in a S. by W. direction, but becoming more N. and S. during the next half-hour.

14.00 A faint aurora developed in a W. by N. direction as an arc over the zenith.

15.00 The curtain still faintly seen, but now more truly E. and W. A faint auroral haze was observable in the S. and S.W. near the zenith.

15.30 Dead-calm atmosphere. The curtain now well defined, trending across the zenith to the W. by N. It was but slightly bowed, with the concavity directed towards the S. It showed a slow body-travel to the E.

16.30 The same curtain appeared, drifted somewhat N. of the zenith, but preserving approximately the same trend. It now appeared to be bowed to the N.; the bowed appearance was, therefore, due largely to the perspective effect, and the luminous band must be almost or quite straight.

4th, 17.15 Aurora absent.

20.00 The aurora reappeared. Streamers located between the zenith and the Western Mountains.

20.20 A couple of small auroral streamers to the W. in the vicinity of the Western Mountains developed almost suddenly into a serpent-like scroll crossing the zenith from the W., then bending slightly to the N. and flanking Mount Erebus. The trend from the zenith across the Sound was W.S.W. The form was that of an exquisitely beautiful draped curtain; the filaments, however, were not readily discerned, because of its zenith altitude. Between the zenith and the western horizon eight or nine flexures existed. The excitation travelled from W. to E. There was a slow drift to the S.E. The maximum brilliance of illumination occurred at the time of its first appearance; a few minutes later the evenly-brilliant lower margin became cleaved by a number of dark partings which developed at regular intervals and with a constant inclination (about 15° to the trend of the folded curtain). For a time, when at its brightest, a red fringe formed a lower selvage. Its originally narrow horizontal width gradually broadened out and finally gave rise to smaller parallel patches.

21.15 Already it had frayed out into several parallel but poorer and less definite bands. It now dispersed, leaving auroral nebula over the whole heavens. In its late stages the arc appeared to stand above Mount Erebus and the vicinity of Mount Lister. It had thus swung somewhat to the S.W. It now appeared to be slightly concave to the S. (probably due to perspective). As many as four parallel bands were now noted in the sky simultaneously; these in turn gave way to scattered nebulous patches. The main trend of curtains swung round more to the N. as the evening progressed, passing from a N.N.E. to a N.N.W. trend (reckoning from the zenith).

24.00 Aurora in patches both N. and S.

5th, 2.00 A curtained arc to the E. of the zenith, trending N. and S. A small patch also to the S.W. of the zenith.

4.00 Scattered patches and irregular nebulous masses distributed over a great part of the sky.

5.00 The visible aurora almost solely represented by nebulous patches; these were particularly bright in the zenith and large in areal extent.

9.00 Nebulous patches distributed over the whole sky. One long band extended in a N. and S. direction and reached the vicinity of Mount Lister. A slow body-travel was observed part of the time, carrying the luminescent patches to the S. A feature of the last eighteen hours was the abundance of the aurora in the W. and N.W., in which quarter it had previously been but seldom observed. Between the hours of 10.00 and 15.00 very little aurora was noted. Such as was observed was of the nature of nebulous patches seen at intervals.

5th, 12.00 A fragment of a curtain was observed trending W. of N.

15.30 A faint auroral blush noted in the W. about 30° above the horizon. This soon faded. At the same time a couple of patches seen to the S.W.

16.20 An auroral nebula again appeared in the same position to the W.

16.30 Nebulous masses were distributed in the sky and fainter blushes appeared in the W.

17.15 Auroral conditions sensibly the same, though brighter generally.

18.00 Strongly-defined nebulous patches in the sky, also a band trended over the zenith from the W.N.W. to the S. side of Mount Erebus, where it curved away from the Mount in a southerly direction. The excitation travelled from Mount Erebus to the N.W.

19.00 Very little aurora remained; nebulous patches.

19.45 A faint band crossed the zenith from the W. and then curved N. of Mount Erebus. This occupied the identical position of the brilliant excitation seen the evening before. Much nebulous aurora seen on the north flank of Mount Erebus; this nebulous aurora travelled slowly in a general northerly direction, varying the while in luminosity, and finally contracting its noticeably luminous part to the Ross Island area.

21.45 The last blush of the above disappeared, after hanging over Cape Bird. Two faint nebulous masses low down in the S. by W. commenced to extend as arcs parallel to the former; that is, S.W. by W.

22.00 Only a trace of the aurora remained. A haze began to settle, and was observed to a height of about 15° above the horizon. Ice crystals formed on the spectroscopic camera.

24.00 The haze showed a pinkish glow.

6th. Between 9.00 and 11.00, though the Milky Way was visible in the heavens, no aurora was noted. A fairly strong haze, as seen last evening.

24.00 An arc crossed the sky near the zenith, trending in a S.S.W. direction; it was nebulous and ill-defined. Part spread slowly downwards in the N.N.E., covering a wide horizontal area. This must have been very close, because Mount Erebus at the same time was quite indiscernible. As we watched the luminescence appeared to come almost to the ground on the highlands of Ross Island some seven or eight miles away. This had the appearance of the luminous fog, and further resembled the luminous clouds noted occasionally.

7th, 00.30 The curtains noted at midnight were still visible.

2.00 Again still visible, but trending in a general N. and S. direction.

4.00 The curtain had broken up, and was represented by nebulous patches scattered in the heavens to the N. and in the S.W.

6.00 A haze was developed sufficient to obscure faint effects; through it a faint aurora was seen to the W.

7th,	8.00	Clear overhead with haze near the horizon; no aurora.
	8.30	A faint nebulous auroral patch to the W.S.W.
	16.00	A faint aurora to the N. No further recurrence by midnight.
8th,	2.00 } 4.00 }	An auroral band N. of and over Mount Erebus.
	6.00	Scattered patches of aurora.
	8.00	A very bright band along the Ross Island highlands.
	9.00	No aurora in the sky. During the morning the conditions remained most favourable for observing the aurora, but none appeared till 14.00.
	14.00	Faint aurora in the S.W. heavens.
	14.30	A typical luminous-edged cloud (definitely auroral) commenced slowly developing in the E.S.E., advancing from the direction of the barrier on to Mount Erebus; this totally disappeared by 16.30.
	22.00	The aurora had been absent till now. A faint gauzy auroral arc stretched from Mount Erebus to the S.W. This later on became brighter at intervals.
	24.00	A faint aurora in the S.E.
9th,	2.00	A bright band stretched across the zenith in an E. and W. direction.
	4.00	Aurora reported in several quarters of the heavens.
	8.00	A nebulous aurora near the horizon from E. to S.
	11.30	Faint auroral phenomena visible in the sky until now. Very thick weather later.
	20.00	Between 20.00 and 20.15 an auroral band shone through the clouds in the zenith. It was dull and ill-defined, but quite distinct, appearing to trend in a N. and S. direction.
10th,		Dense weather.
11th,	2.00	Stratus and altostratus clouds in the S. and S.E. exhibited luminous upper edges due to aurora.
	4.00 } 6.00 }	A faint poorly-developed curtain in the zenith.
	11.30	A faint nebula 45° up in the S.E. During the afternoon and evening the moon obtained considerable power, but moderately strong aurorae could not fail to be seen. None were observed.
12th,	2.00	Aurora in the E.
	2.30	A display over Cape Bird.
	3.30	Display over Mount Erebus.
	3.45	Aurora bright in the zenith.
	4.00	Aurora in the N.E.
	6.00	Auroral display N. of the zenith.
	8.00	Observed to the N.W. of the zenith.
	9.00	Faint traces only remained and shortly disappeared. The displays observed this day were mostly of draped-curtain variety, and, on account of the bright moonlight, must have been unusually brilliant.
13th,		Sky more or less obscured.
14th,	9.00	A nebulous patch directly above the smoke of Mount Erebus. This soon altered shape and developed into a long streamer passing downwards from the sky to the S. of Mount Erebus.

14th, 11.00 } Auroral shafts seen both N. and S. of Mount Erebus.
12.00 } The moonlight obscured all but the strongest effects. Great eruption on Mount Erebus during the day.

15th. } Blizzard obscured view.
16th. }

17th, 8.00 } Aurora in faint patches to the N.E.
12.00 }

18th, 9.00 Auroral streamers on the N. horizon.

12.45 A fairly strong nebula on the N. and S. flanks of Mount Erebus; also in the N.W. heavens.

14.00 A faint band across the heavens in the N.W.; this crossed the zenith and extended to the S.E.

14.10 The band had developed into a very definite and brilliant curtain, though the moon about half-full. The excitation came from the N.W. There was a body-drift to the S. Dark partings (cleavages) developed across the curtain, as described for the evening of the 4th June.

15.45 A little aurora observed in the N.

18.00 No aurora.

23.00 A small auroral curtain in the N., appearing to hang somewhat W. of Cape Bird.

23.30 Patches of auroral light were spread over the whole eastern and southern heavens. To-day auroral phenomena have been visible almost continuously in some part or other of the sky, notwithstanding the half moonlight. The displays have mostly been in the direction of Cape Bird (N.N.E.). The prevalent patches resemble faint white clouds.

19th, 1.15 Aurora over Mount Erebus and in the zenith.

12.00 Aurora reported.

13.30 A remarkable auroral display appeared over the highlands of Ross Island between Mount Erebus and Hut Point. It was first observed as a closed ellipse with the long axis trending almost N. and S. Later the ellipse opened at the southern end, leaving a parabolic form.

17.30 A strong curtain stretched over the highlands of Ross Island from the N. to the S.E.; it passed E. of Mount Erebus. This was a curtain uniformly luminous below and passing upwards into strongly developed vertical streamers. It curved away from the mountain in the vicinity of Mount Erebus. Its disposition gave the impression of low elevation.

18.30 } The aurora is still strong in the same direction.
19.00 }

19.30 Aurora faintly represented near the zenith to the N. by E., also N. by W. near the horizon N. of Cape Bird.

19.40 Four parallel auroral bands crossed the heavens near the zenith and the N. flank of Mount Erebus, trending in a N.E. by N. direction.

20.30 The last traces faded away to the N. of Cape Bird.

20th. Sky obscured in the morning.

15.15 A nebulous glow visible through the clouds to the N.E. The gap in the clouds slowly enlarged and the aurora brightened. Evidently a brilliant aurora was proceeding over the Ross Sea near the Barrier face. The aurora gradually encroached on Mount Erebus.

16.15 } The intensity of the light was much diminished, and
18.15 } continued so until 18.15, when it again increased.

19.30 A very brilliant display was in progress in the N.E., stretching from the N. to E. apparently, over the E. side of Ross Island. This developed in the form of a closed elliptical ring; within, to the N. end, another smaller ring appeared later. The major axes of the ellipses trended to the N.W. In the first instance the rings formed curtains with lofty streamers; in later stages they became nebulous. The illumination died down, and again rekindled at intervals.

20.00 Fragments of other curtains traversed the same area in somewhat varying directions.

20.15 The whole sky within 40° of the horizon from N. to E. suffused in a steady bright auroral glow covering an elliptical area.

21.30 The glow had now completely faded. Whilst this display was in progress to the N.E. no aurorae appeared in other parts of the sky. At a later stage, however, faint bands and streamers appeared in the S. and S.E.; some of these showed recurved western ends. There seemed to be a slight northerly drift of the bands. In the centre of the auroral blaze described in the N.E. were a couple of longish stratus clouds; these appeared very black against the greenish-whiteness of the aurora. The clouds trended about N.N.W. About 9 p.m. other stratus clouds appeared abundantly in the sky. Those in conjunction with Mount Erebus cut it at the 10,500-feet level. The auroral display in the N.E., in its later stages, contracted to the borders of the clouds previously crossing its path. The luminescence also appeared on the southern edge of the cloud-bank to the N., and on the N. end of the Erebus cloud-bank. When the aurora first contracted to these clouds the latter appeared with brightly illuminated borders; this luminescence faded and rekindled at intervals, finally disappearing entirely. Other clouds in the sky to the W. and S. did not show a luminous border.

22.30 A long band, stretched E. and W. across the sky, now appeared at its brightest. It showed a slow movement to the N. A luminous glow appeared around the horizon as the evening progressed; this spread to much of the sky, and appeared quite distinct from that due to the moon, which rose in the E. at 21.00.

24.00 Aurora reported.

21st, 2.00 Aurora reported, scattered generally in the heavens, except W. of the zenith between N.W. and S.

21st, 2.30 Two definite curtains crossed the heavens; one convoluted to form a scroll. Just W. of N. there were four vertical streamers; E. of S. there were two streamers. All the E. sky was occupied by nebulous masses of aurorae. Throughout the morning hours the aurora was specially vivid and ever changing. There was a noticeable absence of aurora to the W., N.W., and S.W.

4.00 No curtains visible, but a large number of vertical beams remained constant in position for a few minutes. Large nebulous masses appeared in the zenith.

6.00 Large nebulous masses on either side of Mount Erebus. Where the nebulous aurorae had been seen there appeared faint cirrus clouds after they had disappeared; these were quite detached from the main body of the clouds. It appeared as if the aurorae had been drawn to these single clouds, and it was difficult to say when the actual aurorae faded and when the faint clouds were not illuminated.

8.00 Faint aurora. Blizzard conditions prevailed most of the day.

18.15 A slight aurora on the N. flanks of Mount Erebus.

20.00 Nebulous bands over Cape Bird.

20.30 An auroral light in the direction of Cape Bird, and especially in a long line southward along the Ross Island highlands. The arc was nebulous, and resembled a luminous fog. It was brightest in the S. The S.W. edge of the arc was bordered by a faint cloud. What were nebulous bands half an hour earlier in the direction of Cape Bird developed into a nebulous ellipse over the northern highlands of Ross Island, just as happened yesterday evening. A high vertical streamer, exactly as accompanied last evening's aurora, rose from the W. border in the same position.

20.45 During the next 15 minutes a strongly luminous nebula appeared on the N. flanks of Mount Erebus, extending N. to the position past Cape Bird. This nebula appeared to reach close to the snow at the 4,000-feet level, and further N. it seemed to reach near to sea level. The whole area glowed simultaneously, the luminescence fading from the S. end. This glow appeared to extend 1,000 feet in the vertical, where it appeared in front of the slopes of Mount Erebus, and thicker in the direction of Cape Bird. The luminous nebula stood out brightly between us and the slopes of Mount Erebus. To-night there was a peculiar haze in the atmosphere, stars being invisible below 10° of the horizon and faint for a further 5° above this. During a high wind, earlier in the day, a haze covered the whole sky, though the largest stars remained visible in the zenith. Early evening set in with permanent horizon haze. At 20.00 this haze was coloured with the peculiar greenish-yellow tint of the aurora. By 21.00 it appeared to be lit with a pinkish glow. At 22,00, for the most part, the colour appeared of a deep puce tint; this

21st. shaded off above through pink to aurora (greenish-yellow) colour at the extreme upper limits.

21.15 A nebulous auroral band fringed the haze in the S.E., waxing and waning for about an hour, and finally disappeared.

21.50 A tenuous auroral belt developed near the S. side of Mount Erebus, above the summit. This trended to the S.W. and drifted slowly to the N. It re-kindled N. of Mount Erebus.

22.15 An auroral nebulous fringe on the horizon haze in the S.E., N.E., and N. During most of the period between 20.00 and 22.00, a perceptibly strong auroral glow illumined the slopes of Mount Erebus.

23.30 Up till this hour a little aurora was noted on both the N. and S. slopes of Mount Erebus. Faint aurora in the N. to S.E. sky.

24.00 Aurora to the N.

22nd, 9.00 No aurora visible, though the sky was clear and the moon young.

12.00 A small aurora in the E.S.E. over Cape Barne.

12.30 Curtains on the N. slope of Mount Erebus visible, though considerable daylight, from the N.

13.00 No aurora.

13.30 No aurora, only a greenish haze surrounding dense stratus clouds over McMurdo Sound. This luminous effect was best defined in the S., as it was obscured by daylight coming from the N. horizon.

14.30 } A nebulous aurora showed up to the S.E.
15.00 }

16.00 An auroral glow appeared through a gap in stratus clouds on the S. slope of Mount Erebus. Extensive distinct auroral luminescence appeared on stratus clouds trending W.N.W. and stretching from Mount Erebus southwards. The same clouds were abundant in the N. and W. sky, but were not luminous. The daylight had withdrawn but a short while from the N. horizon. The strongest luminous effect appeared on a cloud passing over Mount Erebus.

16.45 A fairly strong luminous haze developed about the horizon line of the Ross Island highlands.

17.10 A nebulous glow on the N. end of the summit of Mount Erebus, developing into a horizontal luminous sheet between the two belts of stratus clouds which were in proximity to Mount Erebus, at the 10,500-feet level. This persisted waxing and waning in the same cloud-gap, suggestive of an electric flow between the two clouds. The upper part of the nearer cloud, and the farther part of the more distant cloud, were not lit up, as would be the case were the luminous effect due to reflection from a distant aurora.

17.15 The above conditions continued; added to this also broad streamers passed upward to the heavens to a great height. The two main streamers came down respectively on the N. and S. side of the summit of Mount Erebus. Other strong ones descended on to and terminated abruptly in stratus clouds which cut Mount Erebus at the 10,500-feet level.

22nd, 17.40 The luminous nebula descended till it appeared to skirt the N. highlands of Ross Island.

17.45 The effect still continued, though generally weaker. The luminescence increased over the main cloud strata standing above Mount Erebus; a couple of faint streamers appeared in one part.

17.55 Only small patches at the end of the original phenomena remained, especially the part in proximity to Mount Erebus was most persistent. At this time the horizon-haze over McMurdo Sound appeared puce-coloured below and pink above.

18.00 A faint blush appeared fading away over the N. slope of Mount Erebus.

18.30 No aurora. Horizon glow strong this evening.

19.35 A faint nebulous blush high above the horizon to the S.E.

20.00 A faint distinct auroral blush to the S. connected with the upper luminous fringe of the horizon-haze. The haze had now cleared mostly from the Ross Island highlands, but was as strong as ever over the Sound. A faint auroral band appeared across the sky to the S. of the zenith, trending E.N.E.

20.30 The auroral band persisted and a stronger, though still faint one, crossed the heavens to the S. of the zenith parallel to the former. This arc was distinctly curtained and apparently very low.

22.45 No aurora. The upper portion of the haze over the Sound faintly luminous lit with the greenish-yellow colour of aurora.

24.00 An auroral glow above and along the upper edge of a large strato-cumulus cloud, extending from the S. by E. to the S.E. by E. The cloud extended upwards for about 8° of arc above the horizon, and the glow extended to a total of about 18° of arc above the horizon. At the same time there was a single large faint beam extending vertically above the summit of Mount Erebus for about 10° of arc. The rest of the sky was clear and starlit. No moon was visible; atmosphere somewhat hazy.

23rd, 00.50 A fairly bright auroral curtain from about S. by E. to E.S.E., with a maximum height of about 40° above the horizon. Below this was a larger and brighter curtain aurora apparently rising from behind a stratus or strato-cumulus cloud-bank to the S.E. A single faint vertical beam was visible simultaneously above the summit of Mount Erebus.

2.00 A couple of luminous auroral patches in the zenith. A faint curtain right across the sky from N.N.W. to S. by E. A bright luminous auroral glow of a pale golden-green tint over the top of an extensive strato-cumulus cloud banked in the direction of Mount Bird, and extending horizontally from Cape Bird for about 30° from W. to E. Vertically the cloud rose for about 8° of arc. The glow above it, which was exactly coextensive with the cloud, extended vertically through about 4° or 5° of arc. There was a slightly luminous appearance in the sky behind Mount Erebus.

23rd, 3.00 A curtain extended from about S.S.E. to about N.N.E. over Mount Erebus, over which it was about 25° high. In the zenith luminous auroral streaks and patches trended N. and S. and towards N.N.W. and N.W. The strato-cumulus cloud-bank slowly spread from Mount Bird across McMurdo Sound to the W. A patch of curtain crossed this cloud obliquely.

3.30 Very little aurora was visible; only a trace of a faint curtain from S.E. towards N.W.

4.00 Faint curtain extending from about S.S.E. to N.N.W. The moon had now risen in a direction N. by E.

5.00 Much cloud had developed in the sky. No aurora visible.

6.00 Luminous stratus cloud to the S.E. Faint luminous auroral belts extended intermittently across the whole sky from due E., just S. of Mount Erebus, to about W.N.W. The belts or luminous bands appeared to radiate from just S. of Mount Erebus and to converge slightly in the opposite direction, W.N.W.

8.00 Slightly hazy, but first and second magnitude stars plainly visible.

9.00 Sky partially clouded over, though stars seen in the zenith Atmosphere slightly hazy. Possibly a trace of nebulous aurora on the N. flank of Mount Erebus, but daylight gleaming from the N. made it uncertain.

10.00 } 16.00 } Frequent observations during this interval found the cloudy, hazy, and daylight conditions so strong as to obscure all but the strongest auroral effects. No aurora noted.

20.00 No aurora, though faint luminous haze on the Mount Erebus slopes.

22.00 A curtain crossed the sky 60° up from the horizon to the S. and trending to the S.W. This composed of streamers, the connecting portions of which were too faint to be visible. Subsequently it became more nebulous with fading of the individual streamers. It also swung round slowly. The phenomenon seemed to be situated at a low elevation. At its first appearance the curtain faded off in the portion extending over Ross Island, becoming too faint to be visible far in that direction.

22.30 It continued over Ross Island, bending round to the North of Mount Erebus and becoming more easterly.

22.45 The aurora now appeared over Cape Bird, where it was nebulous, and certainly at a very low elevation. As seen from the Anemometer Hill it was well below the horizon of Ross Island, and showed up against the highlands on the slopes beyond Blue Lake. At this time the horizon-haze was strongly luminous on the slopes of Mount Erebus and to the S.E.

23rd, 23.00 The trend of the curtain was now N. and S.; the turning movement had also possibly been accompanied by a slight drift to the N., though this is not certain.

23.30 No aurora.

24th, 2.00 Five or six faint streamers rising to a height of about 3° in the N.N.W., and faint streamers in the S. rising to a height of about 40° above a low bank of strato-cumulus clouds.

4.00 Three to four streamers rising from the N.N.W. horizon to a height of about 30°. Also faint streamers rising in the S.E. above a low bank of strato-cumulus clouds to a height of about 40°.

6.00 Streamers rising in the N. on either side of the moon. No sign of the aurora between N. and N.E., but to the S. of Mount Erebus a bright auroral glow appeared above strato-cumulus clouds at a height of about 50°. No distinct nebulae or streamers seen.

9.00 A nebulous patch bow-shaped 60° above the horizon to the N.

10.15 Faint trace only of arc appeared to trend to the N.W. from near the zenith. The more delicate effects would now be invisible on account of a slight fog and daylight in the N.

13.45 Very hazy, so that only the largest stars were visible overhead. Aurora would have to be very brilliant to be seen. No aurora noted.

16.00 The haze now clearing away, but no aurora noted.

19.30 A luminous horizon on the highlands of the N. of Ross Island.

20.00 The glow in this direction became stronger.

20.10 An extensive nebulous luminescence developed around and behind a black cloud over the N. highlands of Ross Island. This descended slowly as a luminous cloud, till finally its lower part appeared between us and the horizon. It therefore descended at least to 5,000 ft. above sea level (the horizon line to the N.E. is about 5,000 feet above sea level). The luminous cloud rose again shortly and again descended.

20.50 The luminous cloud still persisted below the horizon level, though the higher portions of Mount Erebus were plainly visible standing above, and unenveloped by, the luminous fog. In respect of the phenomenon appearing below the horizon level; the luminous area contracted slowly to the N., where it still remained bright, though the southerly portions had faded till they were almost non-luminous. Just above the horizon line a strong display now appeared. A brilliant luminescence travelled backwards at a rate suggestive of about 30 or 40 miles per minute. Streamers descended locally over the direction of Cape Bird for a period of several minutes.

20.55 A luminous haze left, enveloping an area above and below the horizon along the northern highlands of Ross Island.

24th, 21.00 The N. end of the area previously affected glowed afresh for a few moments.

21.15 Minute ice crystals falling. A faint luminescence in the N.E. area and a stronger effect on the upper strata of the horizon-fog to the W.

21.30 Conditions remain the same.

21.45 Luminescent haze to the N.E. still remained.

22.00 Conditions the same.

22.30 Heavier snow fell.

23.00 Continued to snow.

23.15 Clearing in the zenith and to the S. In the zenith the horizon-haze was very dark below, with a strongly luminous upper border. As the sky cleared these conditions found to exist in all quarters. Several parallel luminous bands appeared crossing the sky in an almost N. and S. direction. Several of these bands developed weak streamers. A weak streamer development also appeared on the luminescent upper border of the horizon-haze to the S.; also in the N. at the same time. At the same time some of the zenith curtain streamers (where they approach the horizon) blended uniformly with the horizon-haze. This established the independence of the streamer effects and the luminous horizon-fog.

23.30 } The sky still clearing; horizon very dark to a height
23.45 } of 10°; above this a luminous haze. The luminous appearance was lower to the N. In the S. to W. and in the N. sky several dark patches of cloud appeared in the luminous haze (the latter is of the same intensity as the Milky Way). It was fairly evident from this the main bulk of the illumination originates behind the clouds referred to. In the N. by W. sky near the horizon an indistinct streamer was observed bearing down through the fog.

25th, 00.15 Traces of a curtain 65° up in the E. trending N. and S.; composed of broad streamers terminating in an evenly luminous lower border. A streamer still persisted in the N. by W. As bearing on the possibility of the luminous fog being due to reflection from a distant aurora, it may be remarked that at that time any auroral display would have been visible in the clear starlight sky between the zenith and 10° of the horizon. A cloud mass in the N. by E. sky was surrounded by luminous borders.

00.30 The conditions were generally the same. The luminous belt on the S.S.E. horizon was now brighter, one patch tending to become a streamer. A long smooth nebulous band becoming alternately brighter and fainter crossed the heavens; this extended N.N.W. to the zenith, then bent to a N. and S. trend as far as the N. horizon. A streamer was noted rising from the N.N.E. horizon and afterwards fading.

25th, 00.45 Generally the same. Three auroral streamers rose above the luminous edge of the horizon cloud-bank to the S.E. The luminous haze on the N. slope of Mount Erebus sensibly brighter. A first-magnitude star could be seen faintly through the lower dark horizon-haze to the S.S.E.

1.00 The haze dispersed slowly. A glow observable located at a spot close by the N. slopes of Mount Erebus; this was unusually bright of its kind, and waxes and wanes. A couple of broad nebulous streamers rose from the N.W. to the N.N.W. horizon; these became visible at intervals. A curtain trending N. by W. crossed the sky, commencing just S. of the zenith and terminating immediately W. of Cape Bird; this was very faint and properly observable only after the eyes have accommodated themselves to the outer darkness. Under these conditions even the streamers appeared nebulous, ill-defined, and were separated from each other by broad dark spaces.

1.15 A luminous border was well developed both above and below a cloud-bank extending from the summit of Mount Erebus to the S.E. A couple of faint curtains trended N.N.W. (like that just noted), extending from the N. horizon to the zenith. The more westerly was much the stronger.

1.30 From the spot on the N. horizon which had appeared luminous, a hazy but bright curtain now rose up to the zenith. This slowly faded in about five minutes, but, later, revivified, excitation coming from the N. Trend generally N.N.W., with minor bends. The streamers were not defined; a definite slow drift observed to the S.

1.45 The luminous border on the cloud-bank to the S. was stronger; the same was also very noticeable around a large cloud extending in a N. and S. direction from the top of Mount Erebus. Bright nebulous patches appeared in the sky to the N.W. about 15° up; this was slightly W. of the position of the former curtain.

2.00 The luminous border on the clouds above referred to became stronger. In the S.E. faint streamers rose above the cloud.

2.15 Generally the same, though somewhat brighter. Horizon-haze almost cleared away, especially from N.W. through W. to S.

2.30 Luminous glow on the horizon to the N. of Mount Erebus was strong. A faint streamer was noted descending into a stratus cloud 20° up in the sky to the S.E.

2.45 Small dark clouds to the E. floated in a luminous haze extending to a height of 25° above the horizon. Faint auroral brushes appeared rising above this belt in an E.N.E. direction. An auroral blush appeared on the horizon to the N.W. in the location where the earlier demonstration appeared.

25th, 3.00 The E. horizon much clearer and the luminous glow diminished. A faint curtain crossed the heavens from a point in the N. to somewhat E. of the zenith and trended W.N.W.

3.15 The luminous haze gradually disappeared. A well-defined auroral band commencing in the N.W., where previous activity noted, extended across the sky from the old location in the N.W., almost the E.S.E. horizon; trend, W.N.W. The band composed of nebulous streamers, more or less connected, in linear arrangement.

3.30 A fine curtain aurora of great brilliancy ran across the sky from the old location in the N.W., almost crossing the zenith, and trending W.N.W. The course was somewhat zig-zagged. Streamers fairly well defined. A slow body-travel along its course to the E.S.E. Some time after the main band had formed, auroral nebulae dropped from the curtain below its lower edge.

3.45 Another parallel curtain now appeared close by to the E. of the brighter one; later on this became looped up with the former in two places. Traces of two other fainter parallel curtains showed only at the N. end.

4.00 Altogether five parallel curtains have been visible, but have now faded considerably. Several streamers were seen shooting up from the horizon to the S. of Mount Erebus.

4.15 The curtains brilliantly illuminated half an hour ago were now very faint. Abundant streamers rose in the sky low down between the N. and E. points. These probably originated from two or more parallel arcs. Several streamers bore down on the summit of Mount Erebus and gave the impression of being related to it. One streamer appeared over a stratus cloud to the S.E. Careful observations in regard to the manner in which these streamers become illuminated showed that the dull light suddenly kindles up, the luminescence rises upwards as a shaft; other additions are effected below by the luminescence dropping like a slow rocket.

4.30 The auroral display had almost ceased except in the N. and E., where it was brightening.

4.45 The display concentrated in the N. and E. along the highlands of Ross Island. This was mainly in the form of abundant streamers descending to the horizon level. The excitation travelled from the S. to the N. As the streamers waxed and waned the luminescence gradually spread from the streamers until the whole lower heavens in that direction were faintly luminous.

5.00 Abundant streamers descended on the highlands of Ross Island, immediately N. of Mount Erebus. A single streamer appeared 40° up to the E.

5.15 A luminous glow appeared on the horizon from N. through E. to S.; faint streamers were rising from it.

25th, 5.30 The luminosity near the horizon from N.W. through E. to S. became stronger. In the direction of Mount Erebus this extended to a height of 25° up. An indistinct curtain appeared in the upper part of this luminous belt. There was also a trace of true aurora in the luminous S.E. horizon.

5.45 Conditions the same, though absence of any trace of curtain.

6.00 Faint trace of a curtain to the N.E. above the luminous horizon. Also a faint high streamer descending on to the summit of Mount Erebus.

6.15 Conditions similar, but absence of distinct aurora.

6.30 The upper portion of the luminous haze over the Ross Island highlands glowed at intervals developing a faint curtain. After each rekindling the brilliance of the individual streamers was leavened till the whole assumed an even nebulous appearance. One long streamer appeared 45° up to the S.E.

6.45 The curtain just referred to was now bright, and preserved the same trend. Three or four streamers at intervals dropped to a low altitude below the lower border of the curtain.

7.00 The curtain was present but fainter. A smaller and fainter one appeared 25° up in the W.N.W. sky, apparently trending W.S.W.

7.15 The original W.N.W. trending curtain still faintly visible.

7.30 The same curtain persisted, though now only a faint nebulous band, trending S. of W. Also a small display to the W.N.W., as at 7.00.

7.45 A well-defined semi-nebulous curtain stretched from near the horizon to the zenith, trending N. and S. As seen from below, the planes of luminescence were distinctly warped in the vertical. Several ill-defined streamers appeared in the E. sky.

8.00 The remains of a curtain appeared to the N.W.; also a trace near the zenith. There was a glow on the S. horizon. Daylight began to appear on the N. flank of Mount Erebus, and seemed to be in conjunction with a nebulous auroral display, which, however, was rendered indistinct by the former.

8.15 A curtain which crossed the zenith somewhat bowed to the W., and trending N. and S. Abundance of ill-defined streamers appeared to the E. of the zenith. A streamer visible 35° up to the S.E.

8.30 Streamers of the above curtain still visible. Also streamers seen to the S.E.

9.00 Streamers in the S.E. still. The daylight now sufficiently strong to obliterate all weak auroral effects in the N.E.

9.35 No aurora visible. Daylight sufficient to obscure delicate effects.

10.25 A brilliant double curtain aurora stretched across the whole sky from the S. to the N.N.W.

11.00 The curtain still persisted, stretching across the whole sky. From the W. of its southern end a smaller curtain extended upwards from 12° to 15° above the horizon for about 28° of arc as far as a

25th. point due W. of the zenith. This display in the S.S.W. sprung from the top of a fairly dense stratus or alto-stratus cloud.

11.30 The first-mentioned curtain had now developed into a brilliant luminous arc crossing the whole sky extending S. from the zenith to a bank of stratus cloud in the S., then bending sharply to the W. At the same time the auroral glow from the S.S.W. had spread N. to a point about due W. of the zenith, the arc terminating 30° to 35° above the horizon.

11.35 A few minutes later, about 11.35 a.m., the main curtain aurora broke up in the S. to five immense beams. Meanwhile both this aurora and the one originating in the S.S.W. were very distinctly coloured with a siskin-green to pale peacock-green tint. Excitation appeared to travel from the N. to S.

11.45 Auroral glow over stratus cloud to S. of Mount Erebus.

12.45 Slight auroral glow on the same cloud, the top of which was about 12° above the S.E. horizon. A remarkably sudden appearance of cirrus clouds to the W.N.W. and W.

13.30 A faint bent curtain extended from the E.S.E. to the N.W. passing over the zenith, where it was seen to trend W.N.W. A long but faint auroral streamer, trending W.N.W., appeared just at the spot where the remarkable cirrus clouds were noted previously, the clouds in the meantime having now almost disappeared. At the same time the glow over stratus to the S.S.W. occasionally assumed a curtain structure.

14.00 A fairly bright curtain aurora, extended from the E. by S. to the S. of Mount Erebus, trending in a W. by N. direction, but bending to the N.W. after reaching the vicinity of the zenith.

14.40 A moderately bright auroral arc extended from the S.E. beyond Cape Barne across the zenith to the N.W.

15.00 Three auroral arcs springing from a bank of stratus clouds from the E.S.E. horizon, between Cape Barne and Mount Erebus. The two westerly members were joined together at an elevation of 33° above the horizon. The more easterly arc extended across the zenith, trending to the N.W. by W. The excitation came from the E.S.E.

15.10 The three curtains have now more or less coalesced. They have distinctly travelled N. The main curtain, now springing from the true E. horizon, bent around Mount Erebus, crossed the zenith, and extended to the W. horizon between N.W. by W. and W.N.W. There was a general drift to the N.

16.00 Two auroral arcs extended from about E. by S. on the S. flank of Mount Erebus, up to the zenith, then extending to the W. by N., and finally W.

25th, 16.30 A weak curtain crossed in a W.N.W. direction just N. of the zenith. Several streamers descended below the general level in an eastern extension. It crossed the horizon of the S. slope of Mount Erebus.

17.00 The curtain had now drifted to the N., and crossed the E. horizon just N. of Mount Erebus. Assuming the curtain to be low, the travel appeared to be at the rate of about 8 miles per hour. The brightest luminosity had now shifted to the E. end. Half an hour ago, as it crossed the S. flank of Mount Erebus, it appeared very low, at times appearing to haze the horizon. As it travelled N. it stood clear of the summit of Mount Erebus, the smoke-cloud standing black against it. It now appeared, however, to stand higher generally.

17.10 The central portion of the curtain had now faded, though both ends were still visible.

17.20 Portion of a faint curtain to the W.N.W.; this was the remnant of the earlier reported curtain, which had now drifted further to the N.

17.40 No aurora visible. The upper portion of the horizon-haze to the W.S.W. was faintly luminous.

18.00 A faint auroral band crossed the zenith in an E. and W. direction, extending towards the W. horizon. This appeared to trend more truly E. and W. than the one seen an hour ago (*i.e.*, it had swung from W. by N. to true W.).

18.15 The same band now extended across the whole sky, passing to the E. over the S. flank of Mount Erebus. It was now very faint, more so than the Milky Way.

18.30 No definite aurora. A strong luminous glow on the S. slope of Mount Erebus.

19.15, 19.30, 19.45 No aurora visible. A slight luminous glow above the horizon to the S. and E.

20.00 The luminous glow along the N. slope of Mount Erebus was especially strong.

20.10 The glow on the N. highlands of Ross Island was stronger and abundant streamers ascending from it. The outline of the horizon was sharp against the glow. A few faint streamers appeared above the S. highlands of Ross Island.

20.30 No definite aurora, only a weak glow along the horizon of the highlands of Ross Island.

21.00 A weak luminous haze around the N.E., E., and S. horizon.

21.30 No aurora. Slightly hazier atmosphere, though much less so than last evening.

21.45 Streamers rose over Ross Island highlands from N.E. to S.E. In the S.E. a curtain was weakly developed.

22.00 Well-defined streamers rose from the horizon along the N. highlands of Ross Island to Cape Bird. Also there was a small patch of curtain 40° up in the S.E. sky.

26th, 1.30 Sky clouding over, hazy overhead. A fine auroral beam, situated high up in the sky to the N. A curtain aurora traversed the sky to the N.N.E., passing behind a luminous-fringed, alto-stratus cloud-bank nearer the horizon.

4.00 A bright curtain aurora, stretching to the horizon at each end; trend, N.W. The curtain was, apparently, the fringe to a hazy cirro-stratus cloud which covered almost the whole sky. The direction of the cloud was N.W. and S.E. The aurora was parallel to the long axis and direction of the cloud. The cloud was very tenuous, stars of the first and second magnitude being distinctly visible through it. The aurora gradually lifted towards the zenith, as though eating away the edge of the cloud; meanwhile, both kept the same relative positions in regard to direction. The phenomenon might be likened to a fringed tablecloth being gathered up into a roll with the fringed side kept parallel to the rolled portion. Thus the aurora moved across the entire sky, reaching the zenith at 4.30 a.m.

4.30 Aurora sinking down in the same parallel line to the E. The sky practically cloudless after the passage of the aurora.

5.00 Sky becoming overcast from the N. No aurora.

7.00 Spicules of snow falling. First-magnitude stars only visible between the zenith and 50° above the horizon. No aurora.

8.00 Sky completely overcast and snow falling. During the day the zenith occasionaly cleared to some extent, but no aurora seen.

27th, 6.00 Weather thick. Sky clearing somewhat in the zenith and an auroral glow reported on a cloud-edge to the N. of Mount Erebus, about 25° above the horizon. Weather conditions much clearer during the afternoon and later in the evening; the atmosphere becoming hazy.

18.15 A faint auroral glow with traces of streamers on the edge of a cloud between N. and N.N.E.

21.30 An auroral nebulous arc in the N. by E. Also an auroral arc seen through the haze to the S.

22.15 An auroral fringe around the upper part of an alto-stratus cloud enveloping the summit of Mount Erebus.

23.20 Alto-stratus above Mount Erebus still, but glow not so marked.

24.00 Same cloud capping Mount Erebus and showing an auroral glow at its N. extremity. Also in the S.E. above a bank of stratus cloud there was a distinct luminous auroral glow.

28th, 1.00 The auroral glow still persisted on the stratus cloud to the S.E.

2.00 There was a rather dense stratus cloud to the E.S.E. extending upwards for 12°-14° and horizontally for about 20°. An aurora in the form of a faint luminous glow extended for 4° or 5° of arc above the top of this stratus cloud.

28th, 3.00 Still a trace of this glow, but very faint.

4.00 The wind suddenly shifted to the S.E., and a mild blizzard with a little drift and strong puffs commenced. Instantly a strong auroral beam shot up for a height of 15° or 20° of arc, above the N. end of the great alto-stratus canopy over Mount Erebus, and a strong auroral glow appeared along the top edge of the stratus cloud. At the same time a strong and extensive auroral glow was visible just above a large stratus cloud in a direction N. by E. and N.N.E. A few minutes later drifting snow almost shut out from view the auroral effects, but they remained still faintly visible through the haze and drift.

5.00 A patch of bright glow above a dense bank of stratus and alto-stratus cloud to the E.S.E. There was a slight glow above a cumulus cloud extending from E. to N. by W.

6.00 Strong auroral glow to the E. and a fainter one to N.E.

8.00 Aurora over Mount Erebus. Thick weather during the day. At 15.30 the zenith cleared till larger stars visible.

20.45 An auroral glow noted over the horizon of the N. highlands of Ross Island. At this time dense clouds were spread over this portion of the sky. During the next few minutes the glow spread rapidly. The greatest intensity appeared along the horizon line, whilst a luminous haze crept down the slopes of Mount Bird between us and the mountain; this finally extended as a band at about the 5,000-feet level along the whole face of Mount Erebus. For a time it appeared like faint streamers in a background of nebulous haze. The glow spread above this area until within 15 minutes the whole was aglow.

21.00 Starting from the horizon the luminous glow crept W. towards us, concurrently with which the dark canopy of cloud slowly disappeared. In this process the dark cloud-bank first became furrowed by luminous tracts, which increased in intensity until the former black homogeneous cloud-mass consisted of black island-like cloud-masses in a sea of light. Slowly these islands also disappeared.

21.40 Finally the whole area was occupied by a comparatively faint luminous haze. During this interval a glow brightened and faded on the S.E. horizon. About this time a dark cloud-mass over the Sound became lit by luminous furrows. Faint streamers had been visible at intervals during the evening towards the N.E., especially somewhat N. and W. of the luminous cloud-display noted above.

22.30 The Ross Island highlands were enveloped in a faintly luminous haze, and the cloud-patch had almost entirely gone. Over the Sound the clouds were greatly reduced, and the faintly luminous areas consequently increased; several of these patches were brighter than the rest. A bright luminous

28th. patch with occasional streamer developments, situated N., and to the W. of Cape Barne, had now faded.

24.00 A patch of auroral glow on a cirro-stratus cloud, almost about 12° above the horizon, in the N. by E.; also an auroral glow on a stratus cloud-bank to the S.E.

29th, 1.40 A black cloud just above the N. flank of Mount Erebus, showing an auroral glow on its S. end.

3.00 A definite aurora to the N.N.W. and W.N.W., in the form of two faint nebulous curtains, extending from some 12° above the horizon to the zenith. These appear to converge to the N.N.W. These curtains followed the exact positions where, half an hour before, a thin belt of cirrus cloud was noted.

5.15 } A faint auroral glow over the N. slope of Mount
5.30 } Erebus and three faintly luminous patches extending from about N. to N.E.; these appeared to be associated with stratus or alto-stratus clouds. The cloud referred to at 1.40, situated N. of Mount Erebus, was now glowing at the end nearest the mountain and between it and the latter.

8.45 Twilight now obscured faint effects on the Ross Island highlands.

11.30 A curtain crossed by a parallel parting stretched from the N.W. horizon to the zenith. The daylight caused it to appear dimmer than it really was; for this reason also it appeared a little yellower and colder than normally. The colour may be described as a cold-white. To the N.N.E. there were three luminous patches of the same character and another larger one to the N. These, however, trended to the N.N.E., parallel to the cirrus radiant, and were therefore likely to be faint cirrus clouds. The very similar appearance of these cirrus clouds, and the typical aurora to the N.W., is noteworthy.

14.30 A long auroral arc seen somewhat to the N.W. of the zenith passing out over the Sound.

16.00 Clear sky and no aurora.

17.30 Faint auroral glow amongst low stratus-clouds to the S. of Mount Erebus.

17.45 } No aurora seen. A luminous haze appeared between
18.30 } stratus clouds over the Sound. A similar haze was seen low down over the Ross Island highlands.

20.00 } A very bright auroral band, trending E. and W.,
20.15 } extending from just N. of the zenith to Mount Erebus. This showed a slow drift to the N.W. The band faded and reappeared in patches only. As such bands fade they pass through a stage resembling the frequently-seen luminous haze.

21.30 A fragment of curtain was seen in the zenith, trending approximately N. and S.

21.35 A strong auroral glow seen among the dark stratus clouds to the N. by E.

23.00 Faint glow on the S.E. horizon. Aurora conspicuously absent this evening.

30th, 2.50 An extremely brilliant auroral glow along a dark disjointed bank of alto-stratus clouds, extending along the Ross Island highlands from the S.E. by E. to the N. by W. The glow was especially brilliant along the cloud-edges, and faded away from their vicinity. The luminescence travelled from N. to S.

4.00 In the later hours of the morning a very extensive curtain aurora reported, chiefly in the S.E. sky; this faded at 8.30 a.m.

8.40 A disjointed curtain over Mount Erebus and to the southward of it. The luminescence travelled to the S. The light then concentrated to the S. of Mount Erebus and appeared of a somewhat more yellowish colour than usual, due to the daylight.

8.45 In the E.N.E., where the daylight appeared brightest, a streamer rose from the horizon to the zenith.

8.50 Several streamers scattered in the heavens near the zenith in the S. to E. sky.

9.45 Faint traces of streamers in the S.W. to S.E. sky.

12.00 Long streaks of a luminous-white appearance traversed the sky to the S.; towards the N. these joined into definite cirrus clouds. The difference was extremly difficult to detect. The sky clear all day and evening, but no aurora seen till evening.

22.00 Streamers in the N. horizon.

22.30 A very bright auroral curtain to the E. The excitation travelled to the S. The phenomenon was very low and nebulous over Mount Bird.

23.10 Strong aurora to the S. by S.E.

24.00 Three parallel curtain auroras to the S.E. Streamers well developed. These appeared to trend S.W. to N.E. An auroral glow visible from the direction of Cape Bird. The excitation in the above curtains appeared to travel from S.W. to N.E., but not very definite.

July.

1st, 1.00 An auroral band with a remarkably even top extended across the E. sky about 12° above the horizon. It is brightest in the N.N.E.

2.00 Curtain in the N.N.E., about 10° up. Curtain in the S.E., about 10° up.

3.00 Curtain over Mount Erebus. Small patches of curtain in the S.E., S., N.E., N., N.W.; these were numerous and scattered. A large bright auroral band near the zenith trending N. and executing remarkable curves in part of its course.

4.00 Rows of parallel curtains in the N. and N.E. travelling rapidly to the N. A faint auroral glow to the S.E.

4.40 Streamers and a small curtain extending from the N. to S. to a height of 35° above the horizon. A small curtain to the E.S.E., in which the excitation travelled N.

6.00 A curtain to the N. and N.E., also low down on the horizon. Streamers in the E. and S.E., rising to a height of 45°.

1st.	7.30	Auroral glow stretching from N. to S.E. One bright streamer to the N.N.E., rising from the horizon to about 45°.
	14.30	A glow on the S. side of Mount Erebus, shortly giving place to auroral shafts, and later to a curtain extending along the horizon through about 30° of arc.
	15.00	The above curtain had entirely faded, and a fine curtain developed along the area to the N. of Mount Erebus. This faded in about 20 minutes.
	17.15	Several shafts over the horizon to the S.E. by E. The sky had been clear, but scarcely any aurora seen till after 22.00.
	22.45	A faint arc trending N. by E. from the N. horizon to the zenith.
2nd,	3.30	An auroral glow over a low cloud in the N. and a streamer on the left side of the same. Shortly this developed into a small curtain near the horizon. Weather became dense and blizzard conditions prevailed.
3rd.		Blizzard all day obscuring the sky.
4th,	2.30	An auroral glow on a cloud between W.N.W. and N.W. at 40° above the horizon.
	3.30	An auroral glow on clouds near the S. horizon about 12° up. Weather mostly overcast, but clearing somewhat on rare occasions.
5th.		Weather conditions much the same, though clearing further.
	1.45 } 2.30 }	An auroral cloud stretching W. by N., where it was about 45° to 50° above the horizon down to the horizon in the N. The outline was rendered indistinct by falling snow. This must have been a powerful display, as first- and second-magnitude stars only were visible through the falling snow.
	8.00	Slight auroral glow to the N.W. Day partly clear, but no further aurora noted till 23.00.
	23.00	Sky clear. An auroral glow along the horizon from Mount Erebus to Cape Bird, in which area abundant streamers were descending.
6th,	00.30	The display to N.E. had now faded, though a faintly luminous haze continued for some time.
	2.30	Faint broad streamers were descending over a large area just N. of Mount Erebus. The streamers terminated below on top of a large stratus cloud, and did not appear between this cloud and the horizon.
	14.00	Small aurora to the N.
	14.45	Faint auroral rays rising to the E.N.E. Moon rising in the N.N.E.
	15.30 } 15.45 }	A stronger band with faint curtain structure extended from Mount Erebus to the N. and N.W. The auroral light exhibited a definite green component when seen in the moonlight.
	17.30	A curtain extended across the zenith, trending E. by N. This was fairly bright, and lasted about 15 minutes. Between the above displays and till 9 p.m. no aurora visible. The moonlight, however, was strong enough to obscure the fainter exhibitions.

6th. 21.00 Long faint streamers bearing down on the N.N.E. horizon.

22.15 A faint though definite and well-defined curtain trending E. by N. across the sky from a point just S. of the zenith. It was composed of isolated streamers which slowly drifted to the E.

22.30 A faint auroral band across the heavens in the S.W. up to a height of 45°; trend, W.S.W.

23.15 A faint curtain extended across the sky in the zenith trending N. by E. There was a streamer also near the N.N.W. horizon.

7th. 2.00 A brilliant curtain developed overhead in the form of an almost complete circle. Coming from the S.E., this crossed the sky just E. of the zenith, then swung round by the N. end of Ross Island and crossed round the E. side of Mount Erebus. The E. side lasted longest, about 8 minutes. As this circular curtain faded it appeared to increase its diameter. A long wisp of stratus cloud extended from the summit of Mount Erebus along the Ross Island highlands. Streamers descended on to this, but did not show nearer the horizon. Fainter streamers descended to a thin cloud to the S. of Mount Erebus.

4.00 The S.E. to N. by W. sky contained abundant scattered faint streamers, evidently parts of faint curtains.

12.30 } An extremely brilliant curtain aurora. This display
13.00 } was mainly in the form of a long bow extending across the eastern sky from the horizon at Cape Barne to the horizon at Cape Bird; the bow was definitely curved to the W. Streamers were not defined. A second parallel arc, very shortly after the appearance of the first, developed nearer the eastern horizon. This second arc commenced from a luminous point on the E.S.E. horizon and developed to the N. A body-travel appeared to carry the arcs to the N.N.W. The colour differed somewhat from that usually seen in a dark sky, in that the upper portion appeared a faint reddish-green. At this time the moon appeared near the horizon, just to the N. of Mount Erebus.

13.45 An auroral arc, convex to the W., generally similar to the above, stretching from the horizon at Mount Erebus to the N.N.W. horizon. The moon above the horizon nearly in the centre of the display. Colour appeared pale, as is usually noted when sky illuminated by daylight.

14.05 Sky very clear, no aurora visible.

14.40 An auroral display noted from S.E. to E. by N. Two nebulous arcs, one above the other, at a height of about 12° above the horizon, extending from just to the N. of Mount Erebus to the horizon at Cape Barne. Isolated streamers rose from these at intervals. An important feature was a faint streamer directly above Mount Erebus, which gradually broadened until, in a few minutes, the

7th. whole of the summit of the mountain was capped by a brush of streamers rising to a height of about 5°. This brush became very bright, and at this time no smoke could be seen rising from the crater. A few minutes later it waned, and as it did so a column of smoke became visible between us and the luminous glow. During this time a bright glow occasionally appeared over the crater. This evidence appears to definitely relate the auroral brush to a close proximity with the summit of the mountain.

15.00 The aurora still continued.

16.30 } Auroral streamers and a low nebulous were visible to
17.45 } the S.E. and E., passing from the horizon behind Cape Barne to the E. of Mount Erebus.

17.50 Practically no aurora now visible.

18.00 Auroral glow and streamers on horizon to the N. of Mount Erebus.

22.00 A distinct auroral glow observed on a stratus cloud 15° up to the S. by E. A faint curtain 40° up extending from E. to N. (moonlight obscured faint effects).

22.30 About four brilliant parallel curtains, situated to the E. of the zenith, trending N. and S.; slight body-drift to the N.

23.00 The outlines of the previously-observed curtains were now but roughly indicated by the distribution of isolated nebulous blobs. Only the very slightest body movement to the N. The night was unusually calm and the aurora steady.

23.30 About six parallel curtains extended over the whole sky, excepting between the S.W. and W.N.W. They trended in a general N. and S. direction, but were bowed convex to the W. They exhibited a slow body-drift to the N.

24.00 There were three parallel curtains in the E. sky similar to those just referred to. That nearest the zenith was 70° above the horizon. The others were lower down, and met the horizon between N.E. and S.S.W. The trend appeared to be still N. and S.

8th, 00.30 An auroral curtain crossed the sky near the zenith about 80° above the E. horizon. For the most part this trended N. and S., but was bowed, with a slight convexity to the W. The luminosity was greatest in the N. A fragment of another curtain was visible 15° up in the S.E.

1.00 Faint streamers rising above the Ross Island highlands between N. and S.E.

1.30 Very faint streamers rising high up above Ross Island highlands. A luminous haze developed in the vicinity of the horizon. Careful observation showed that this haze passed above into faint streamers, rising as much as 12° above the horizon.

2.00 A fairly well-defined curtain extended to the S. from just E. of the zenith; trend, N. and S.; slow body-travel to the N.

8th. 3.00 Five parallel curtains, trending N. by W., occupied the sky to the N. and E. of the zenith; they continued S. from the zenith, but faded in that direction.

3.30 Two curtains stretched across the N.E. sky to the N. horizon; they trended somewhat W. of N.; body-travel to the N., and appeared to be more rapid than earlier in the night. Very faint streamers were scattered about in the S.S.E. sky up to a height of 50°.

4.00 Two faint curtains in the N. One of these appeared to continue in the S.S.W. Faint traces of streamers around the horizon in the N.W.

4.30 Only the faintest trace remained of the curtain to the N. and N.E. One bright streamer ascending from the N.W. horizon. The curtains referred to earlier, and now fading in the N., were not of the delicate draped-curtain variety, but composed of aligned nebulous blobs representing the brighter visible portions of a really continuous curtain.

5.00 A brilliant fragment of a curtain in the S.E. sky about 50° up, trending W. of N.; rapid body-travel to the N. Numerous faint streamers rising in the N. sky and aligned along the same direction. One bright shaft rising from the W. by N. horizon.

5.30 Two parallel curtains crossed the sky from the N.W. horizon to a point just E. of the zenith; trend, W. by N. Body-drift, moderately slow along itself to the W. by N.

6.00 Numerous faint streamers near the horizon in the N. to N.W.; to a less extent on the S.E. horizon.

6.30 A curtain crossed the heavens from the N.W. horizon over the zenith to a point 45° up to the S.E.; the S. extremity was very faint; trend, N.W.

7.00 The remains of the curtain just referred to were now visible only to the N. of the zenith.

7.30 In the N.W. as far as the horizon the curtain seen earlier was now represented by a hazy luminous band; two faint streamers were hanging in the S.E. sky where the curtain previously extended.

8.00 Faint streamers were visible in the S.S.E. sky up to a height of 40°. Daylight obscured delicate effects in the N.N.E.

8.30 Two faint streamers visible near the horizon to the N.N.W.

9.00 No aurora. Weather clear all day. Moon half-full, obscured faint effects. Watch kept, but no aurora visible till 23.30.

23.30 Faint isolated nebulous fragments of an arc crossing the sky to the E. of the zenith about 45° up. These were visible only S. from the zenith; trend, approximately N. and S. A further patch appeared nearer the horizon to the E.S.E. For a few moments another became visible S.W. of the zenith, 30° up.

8th, 24.00 A well-defined curtain extended across the heavens just E. of the zenith from the N. almost to the S. horizon; trend definitely N. and S.; the N. end the brightest. Viewed from below it appeared nebulous, streamers not being perceptible; in the zenith it slowly broadened out till its base covered 80° of arc. It showed the cross-cleavage noted in the case of several previously; drift was almost imperceptible, if any it was to the N.

9th, 00.30 Two well-defined curtains crossed the sky in a N. and S. direction E. of the zenith. The nearer one was elevated about 45° above the horizon, and extended through a horizontal arc of about 90° (appearing to hang over Ross Island); the second curtain was at a lower elevation. A small fragment of a further curtain, apparently parallel to the two previous, was visible 25° up from the N.W. horizon.

1.00 Streamers scattered irregularly in that area of the southern sky extending from the zenith to 35° above the horizon; these soon faded. During the later morning clouds became prominent. Just before noon an alto-stratus band in the zenith presented in detail the appearance of an auroral band. The sky became more obscured in the afternoon, and a blizzard commenced in the evening.

10th. Blizzard conditions. As the blizzard cleared brightly luminous edges appeared on some of the clouds; this luminosity was undoubtedly owing to the moon, which is itself not visible.

11th. Sky clear during the morning, but no aurora visible; clouded and hazy in the evening.

12th. Overcast, so that records of aurora not possible.

13th. Sky clearer in early morning, overcast later in the day.

14th. Overcast.

15th. Thick weather.

16th. Weather clearing.

15.00 A faint auroral band trending in an approximately N. and S. direction across the zenith. Moon was low down near the S.E. horizon; the sky was slightly veiled by a thin cirrus haze; cirro-stratus clouds well developed in the southern sky.

17.00 For a period of some five minutes a bright auroral light appeared as a knot in the zenith, from which short tongues diverged, the principal of which trended to the S.W.

21.00 A long auroral arc faintly visible crossing the zenith in an E. and W. direction parallel to well-developed cirro-stratus clouds trending in the same direction. At this time the moon was well up and the largest stars only were visible.

17th, 2.15 An obscure curtain trending in a S.E. direction through a horizontal arc of about 40° to the E. of the zenith some 45° above the horizon; this display waxed and waned and altered form somewhat. Evidence observed suggested it to be at a higher elevation than the Noah's arc cirro-stratus

17th. clouds, which trend about E. and W. The moon is bright in the N.

13.30 An auroral glow had for some time been observed waxing and waning on a light cloud-bank 10° above the horizon to the S.E. by S. Faint streamers rose from time to time. The sky was almost clear overhead.

15.00 A strong auroral display in the form of a long band trending S.E. by E., and extending from the S. horizon to a point in the W. 70° up. As this band faded, another developed parallel to it, extending from the S. horizon, crossing the sky only 5° to the W. of the zenith; this band was sharply delineated along its E. side, but fuzzy to its W. border; the arc bowed slightly concave to the W. The display must have been a strong one on account of its brightness, notwithstanding the red glow from the daylight on the N.W. horizon and that from the moon on the S. horizon.

15.15 The arc had swung round noticeably to the E.

15.20 This was the brightest period; the arc extended from the S. to N. horizon and had broadened out very much over Ross Island, being quite 20° of arc in breadth at the zenith; the southern end over the Ross barrier swung still further to the E., forming a noticeable elbow. The whole display exhibited a body-drift to the S.E. A cross cleavage was well developed, though differing from earlier observed cases in that the planes were now curved. At a later stage the more intense belt formed itself into a scroll-like pattern. An offshoot ran out from the zenith to the N.N.E., travelling over some 30° of arc in a few minutes. Shortly afterwards a portion of a band trending N.N.E. developed over Mount Erebus, but soon faded.

15.45 The display had now faded, and remained visible only on the S.E. and E. horizon, where, however, it was bright.

16.00 A fairly bright band had developed along the Erebus highlands about 30° above the horizon.

16.15 A brilliant display progressing to the E. of Mount Erebus and as far as the S. horizon. Chiefly observed was a long and brilliant curtain with lower margin 10° above the horizon, and high streamers extending to a height of 25°; this band showed a coloured selvage below. Shortly afterwards its N. extremity appeared to hang over Mount Erebus, and a ring (open only in the N.) developed, apparently hanging over the cone of the mountain; the excitation travelled to the S., producing the appearance of a rapid rippling of the luminescence. At a later stage a strong auroral glow rose from the N. top of Mount Erebus. The N. highlands of Ross Island were covered by ragged cumulus-nimbus clouds, and behind these an auroral glow was observed, which, however, did not produce the effect of a luminous edge.

17th, 16.30 The brilliant curtain noted in the last entry faded, and now another nebulous band seen further to the E.; this brightened at intervals, and gradually sank down to the E. horizon.

17.15 A fainter display still proceeded along the N.E. to S.E. horizon. Streamers ascending from the horizon, especially about the summit of Mount Erebus, where they are actually higher than elsewhere, and thus appearing to have some connection with the mountain. Streamers are also specially developed above two small cloud patches, one to the N.E. and the other 15° up in the due N.; in these cases the streamers appeared to spring upwards from the clouds.

17.30 Aurora still on N. horizon.

18.45 A bright curtain appeared 10° above the N. horizon, extending through a horizontal arc of 45°. Portion of a further curtain showed over a cloud on the horizon; trend, W.N.W.

19.00 } Auroral display to the N., between E.N.E. and
19.25 } N.N.W., in which some brilliant circular (enclosed) curtains composed of delicate filaments were exhibited. In the case of one of these the ring opened out after breaking at one side until it became almost a straight line; the excitation travelled rapidly to the S. At this time streamers rose from the summit of Mount Erebus.

19.25 } A remarkably brilliant and fine auroral circle spread
19.45 } around the N.N.E. sky. It came from a cloud-bank on the N.N.W. horizon (W. of Cape Bird), passing nearest the zenith at a point 45° up to the N.N.E., and disappearing over the N. flank of Mount Erebus in the N.N.E.; the outline thus formed was part of a huge circular arc convex to the S.S.W.; it showed a coloured selvage below; slow body-travel to the N. by E. horizon; the excitation travelled rapidly, rushing wildly from end to end and giving the appearance of wave-motions from either end. Concurrently the upper portions of another curtain appeared above the cloud-bank on the N. horizon.

21.00 A faint auroral glow over cloud-bank in the N. The moon was high up and brilliant to the S. of Mount Erebus, and shining on a dense cloud-bank along the N. highlands of Ross Island, imparted the appearance of a luminous upper border; this latter, due to reflected moonlight, was obviously different to the usual type listed in these notes.

21.45 A well-formed curtain arc again appeared in approximately the same position as that just faded. The shape altered, and at one time there were as many as three parallel straight curtains trending more or less E. and W.; these were, however, only of short duration.

22.15 A strong auroral display in the N. and N.N.W. in the form of curtains and nebulous patches. Shortly, the display developed into a long curtain extending from the N., passing 45° up to the W.

17th. of the zenith, and reaching almost to the S. horizon.

23.00 Patches of the aurora aligned in an apparently N. and S. direction some 45° above the W. horizon. An auroral band developed in the S. and S.S.E. preserving a general S.S.W. trend; subsequently this was observed to be bowed slightly with convexity to the N.

23.10 There was now a strong auroral display in the E.S.E.

23.15 A small patch of aurora in the S.E. A well-developed band trending N. and S. crossed the sky 5° E. of the zenith; this was to some extent discontinuous and bent.

23.20 A fainter band developed eastward of the former; coming in a northerly direction from the S. it passed to the E. of the zenith about 50° above the horizon, then swung to the E. round the N. flank of Mount Erebus.

18th. 00.15 A faint band 20° up in the S.E., trending S. by W.; this shortly faded away.

00.40 Two parallel bands appeared to the S.E. 25° and 30° above the horizon respectively, and occupied a horizontal distance of 50° of arc. Ice crystals had been falling from a cloudless sky during the evening.

1.45 A long and moderately strong auroral curtain crossing the zenith in a N. and S. direction. Nebulous patches also appeared 45° up in the W. and 20° up in the W.N.W. respectively, and were elongated in a N. and S. direction.

1.50 The display was now mainly represented by a huge nebulous patch 45° up in the E.S.E.

2.15 No aurora.

3.45 A faint curtain aurora extended from the S.E. to the N.W., stretching from near Cape Barne to a point a little E. of the zenith, then across to the N.W. The night watch reported no aurora seen for the rest of the night. Much cloud in the sky between 5 a.m. and 6 a.m.; also moonlight sufficient to obliterate delicate auroral effects.

10.15 No aurora.

11.15 No aurora.

13.45 } The edge of a dense cloud between the W. and N.W.
14.45 } horizon appeared illuminated till 13.45. It had the appearance of auroral glow, but is most reasonable to connect it with the daylight beyond the N. horizon; at one stage a faint streamer was seen to rise amongst it, so that apparently at least some trace of aurora in that direction.

15.15 An auroral glow on a cloud-bank to the S.E.

15.25 Streamers appearing in the S.E.

15.45 } Auroral bands trending in a somewhat N. and S.
16.15 } direction across the E.S.E. sky; they slowly travelled to the W.N.W.

16.20 The chief display was now in the form of a huge circle enclosing mainly the E.S.E. sky, but finally passing over somewhat to the N.W. of the

18th. zenith. That part near the zenith was most vivid, and even showed a faintly-red selvage below. The luminescence surged backwards and forwards along the arc, apparently with a stronger southerly movement. For some time the great circle had kept opening out, apparently enlarging its diameter, though obviously engaged in a

16.35 general N.W. travel; when, however, it had reached a point a little to the N.W. of the zenith this travel ceased. This was the period of its greatest brilliance. Patches of concentric rings were noted within the larger. One of these inner rings, which, however, was somewhat eccentric (to the N.E. of the centre), attained great brilliance, and even showed a strongly coloured selvage.

17.05 The display has died away.

17.35 Aurora absent.

17.45 A blob of auroral nebula near the horizon in the N.E. by N.

19.45 No aurora seen.

20.35 Absence of aurora.

21.55 Auroral streamers on the N. horizon. No aurora was seen later, though the sky remained clear for some time.

19th, 16.40 Auroral glow in a faint arc N. to W. about 30° up, bowed to the S.; trend in a general E. and W. direction.

20th, 2.00 An auroral glow over a considerable area in the N. sky. From this were brighter ribs radiating to the S. The stronger of these curtains extended beyond the general glow and passed southward of the zenith. In the latter direction, where they were thinner, they appeared in the form of strings of disjointed vertical streamers.

16.00 A glow on a cloud to the N.

18.00 Cloud glow to the N.

22.45 A faint nebulous auroral arc crossing the sky from E.S.E. to W.S.W. some 5° or 10° S.E. of the zenith; bowed noticeably, with concavity to the S.E.

23.00 The arc just referred to had straightened and crossed the zenith, trending N.N.E. and S.S.W.

23.30 Three faint parallel curtains in the zenith and east of it, extending from near the N. horizon to within 20° of the S. horizon, and trending N. and S.

24.00 Two blobs of auroral nebula in the S.S.E. in the position of the earlier arcs. An auroral haze in the E.

21st, 1.45 Two curtains, one 30° up in the W., the other 45° up in the E. The mean direction of trend about N. and S., but bowed concave to the W. An indefinite auoral haze to the E. The night very dark and the sky clear. The aurorae were very faint, and visible only on account of the favourable conditions.

21st, 2.15 A fragment of a curtain in the N.W. Two long curtains, extending from the N. horizon to just past the Cape Royds, situated some 45° up in the E., and trending about N.N.W. In the N. these latter curtains entered an extensive luminous area that extended over a clouded zone.

3.00, 3.30 Abundant streamers, apparently portions of curtains, situated in the S.E. sky. A glow still persisted from Mount Erebus to the N.

5.40, 6.00 Scattered streamers hung in the N.E. and S. sky. Usually more than one streamer in curtain-like relation.

8.00 Faint detached auroral streamers outlining a curtain more or less N. and S., situated some 30° up in the S.E.

8.20 Same as last observation. The daylight now sufficiently strong in the N. to make these streamers scarcely discernible. Faint detached streamer-curtains were a feature of last night. They showed very little horizontal movement, and, though faint, remained remarkably permanent, as if in key with the calm surface atmospheric conditions prevailing.

22.15 A streamer in the N. sky, about 25° up.

22.30 Aurora absent.

23.50 A succession of faint streamers outlining a curtain trending N.E. by N., visible 25° up in the E.S.E. Similar to the case of the previous evening.

22nd, 00.30 A faint streamer 30° above the horizon to the S.

1.00 A streamer in the N.

2.00, 4.00, 6.00 A succession of faint curtains similar to those of last evening.

During the day and until midnight no aurora was seen, though the sky clear.

23rd, 00.30 An auroral glow on a cloud over Mount Erebus.

1.30 As noted at 00.30. No further display until the following evening.

20.30 A curtain composed of very faint streamers, extending in a general E. and W. direction from the E. horizon to a location 35° up in the S.

20.45 A curtain crossed the zenith and extended some distance to the W. This trended E.N.E., and was kinked to the N., where it passed Mount Erebus. A streamer over Mount Erebus. The curtain reported at 20.30 had now moved to the N.

22.30 Two streamers seen in the N.

23.15 A fragment of a faint curtain seen in the S.S.W., trending to the S.S.W. A streamer 20° up in the N.N.E. and another in the E.S.E.

24.00 A curtain of the faint streamer type trending N. and S. across the zenith.

24th, 00.30 The aurora continued.

3.20 A contorted curtain to the E.N.E., near the N. flank of Mount Erebus.

6.00 A curtain in the N., trending E. and W.

20.30 Streamers in the E.S.E.

20.35 Streamers N. and S. of Mount Erebus.

24th, 21.00 A very strong auroral glow behind Mount Erebus, throwing up the latter in strong relief.

22.00 A very strong curtain, trending N.W. along the highlands of Ross Island. High streamers arising from this zone in the N. When strongest this appeared as a uniform intense glow. At other times filaments were distinct and rapidly vibrating. Chief travel of excitation from the N. to S. Appeared to be a slight drift to the N.W., where in proximity to Mount Erebus it became distinctly kinked to the E. It waned from S. to N. In its later stages subsidiary curved portions formed at the S. end and in the N.N.E.

22.30 A curtain, trending N. and S., somewhat E. of the zenith, best developed in the N.E.

23.00 An extensive curtain, trending N. by E., over the zenith from S. to N. Its continuity broken in several places. The luminescence was strongest in the N. It showed a slow but definite drift to the N.N.W.; 20° up in the E. was another parallel band.

23.15 The curtains previously noted were now a little more to the W. The more westerly now fading.

23.30 The remnant of the long N. and S. arc visible in the far N. and just S. of the zenith.

24.00 Remnants of the N. and S. curtain still remained, also a streamer patch appeared N. of Mount Erebus.

25th, 00.30 A large patch of aurora in the zenith, also several broken lines of aurora towards Mount Erebus.

2.00 A curtain aurora to the E.S.E.

4.00 A stratus cloud to the N. with an auroral glow over it. The aurora died away in the N.

6.00 A curtain aurora to the N.W. Daylight subsequently obscured observations. A blizzard prevailed during the day.

23.30 Blizzard still blowing and an aurora visible above in a fairly clear sky. The display, in the form of two parallel curtains, trending approximately N. and S. A strong glow also observed along a cloud-edge to the E.

24.00 An auroral display, chiefly centred in the N. On account of the driving snow-grit could not closely observe its movements, but it appeared to be comparatively steady.

26th, 00.30 An auroral display in the S.E.

2.00 A strong auroral glow in the S.E.

6.15 Auroral curtains along the horizon from N.E. to W. by N.

7.00 A slight curtain aurora in the S.E.

19.30 An auroral streamer in the N. The sky frequently observed towards midnight, but no aurora seen.

27th, 2.00 An auroral glow to the S.E., also one streamer 20° up to the S.

4.00 A faint curtain very much broken up in the N. and N.E. A curtain in the zenith; an auroral glow in the S.

6.00 Fragments of auroral curtains in the sky.

28th, 1.45 A fairly bright curtain, slightly bowed towards Mount Erebus, trending more or less N. and S., extending from 5° above the N. horizon to 20° above the S. horizon, and passing Cape Royds 45° up in the E. The display was very steady, and consisted of nebulous-blurred streamers separated by dark areas.

2.00 The above curtain now trending N.N.W.

16.30 A curtain, trending approximately E. and W., extending from 45° up in the S.E. to half-way across the sky. This display was very steady.

19.45 A very faint curtain visible in approximately the same location as that just referred to.

20.30 Two parallel curtains, one about the same position as that of 16.30, the other further to the S.

21.30 A bright nebulous aurora in the form of a band 10° up in the S. to E. horizon. After this the aurora died away.

29th. Auroral curtains continuously seen throughout the early morning hours.

00.45 Two curtains in the S.E. and a glow in the S. sky 10° up.

2.00 Curtains, chiefly in the E.S.E. and S., very brilliant.

2.15 Five concentric curtains with very long streamers trending from the S.E. to the zenith, then to the N.; these occupied the sky between the zenith and Mount Erebus. In the zenith they were particularly bright. After about 5 minutes the luminescence in the curtain crossing the zenith concentrated overhead, and as the curtain faded nebulous masses were left there. Body-travel was not noticeable.

3.00 A curtain crossed the zenith moving to the S. rapidly.

4.00 Curtains, chiefly in the N.E. and S., very brilliant.

6.00 Fragments of curtains scattered over the zenith and E. sky.

8.00 Aurora, chiefly in the S.E.

30th. Aurora appeared to have been almost absent during the early morning hours.

3.00 A faint curtain in the S.E. to N. near the horizon. The early evening was hazy, but a strong aurora would have been easily visible in the greater part of the sky.

21.30 No aurora.

22.00 A fairly strong auroral glow with traces of streamers rising from a long cloud down the Sound, apparently connected with the cloud.

22.45 A slight luminosity on the cloud over the Sound. A strong glow from the top of a cloud 6° above the horizon to the E.S.E.

23.00 A glow along the N. and S. flank of Mount Erebus. A couple of faint streamers rising from the N.E. horizon.

23.15 A faint luminous edge on clouds to the S. and E. N. of Mount Erebus a streamer-curtain ran from N. to S. from the vicinity of Cape Bird to Mount Erebus, also a faint curved portion to the W. of

30th. the latter. In a few minutes the streamer character was lost and a nebulous band, remaining fairly stationary, took its place. This aurora was low on the horizon and appeared along a cloud edge; where the cloud faded the aurora decreased in intensity.

23.30 The edge of clouds to the S. and E. now brightened up, and streamers ascended from them.

31st, 00.15 A definite auroral glow on the horizon clouds from E.N.E. to S. Aurora apparently absent most of the early morning.

6.00 A disconnected curtain from S.E. to N.E., fairly low down. Excitation travelling to the N.

7.30 A glow near the S. horizon.

8.30 A curtain, about 9° up, just S. of Mount Erebus. Thick drift during the day, clearing a little after 4 p.m.

16.30 Two faint auroral streamers over the horizon to the N.E.

18.30 A glow on a cloud just S. of Mount Erebus.

20.00 Drift now thicker, and continued so.

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2nd, 00.30 Aurora almost absent, only a faint streamer 30° up in the N.E.

00.45 A long thin band traversed the sky somewhat E. of the zenith, extending from S. to N., with a westerly turn at the N. end.

1.15 Only the faintest trace of aurora in the form of several faint beams 40° up in the S.E.

2.00 A single very faint streamer 30° up in the S.

2.30 Two faint auroral curtains, trending N. and S.; one crossing the zenith, the other a little to the E.

4.00 A faint trace of a curtain about 30° up to the E., extending in a general N. and S. direction.

6.00 Nothing showing.

20.00 A faint auroral glow behind Mount Erebus.

21.30 A thin curtain stretched across the zenith in a E.N.E. direction.

22.00 The same curtain persisted.

22.30 An auroral glow in the E.S.E., developing into a faint curtain, travelling to the N.W. A remnant of a curtain to the N.W. A streamer about 15° up to the E.N.E.

23.00 Two parallel curtains close together crossed the zenith with a N.N.E. trend. They were strongest in the S.S.W., and were bowed slightly concave to the S. Body-travel to W.N.W. A third parallel curtain rose over horizon from E.S.E.

23.30 A curtain 20° up in N.N.W., trending about N.E.; the curtain composed of isolated high streamers.

24.00 Two faint curtains, trending N.N.E.; one crossing the zenith, the other 45° up in the N. Only the horizon ends were represented. The greatest intensity of aurora this evening was between 22.30 and 23.00.

3rd, 22.00 No aurora reported. Sky obscured until 22.00.

24.00 Aurora in E.S.E.

4th, 1.45 Disjointed curtains in the eastern half of the sky and even to the zenith, trending in a general N. and S. direction.
2.00 Auroral display in the N., E., and S.
4.00 Aurora in the E.S.E.
4.45 Disjointed curtains low down around three-parts of the horizon; not in the W. to S.
6.00 Long streamers over the Mount Erebus horizon.
6.20 A long low curtain in the E. sky, stretching from S.E. to N.W.
20.00 No aurora.
21.00 A streamer-curtain, trending mainly E. and W., and bowed to the S., extending from W. to S.E., at an elevation of 40° above the S. horizon.
24.00 Very faint nebulous streamers 60° up in the S.S.E., 20° up in the S.E., and on the E.S.E. horizon.
5th, 00.20 A detached curtain from low down in the S.E. to E.
2.15 Patches of a moderately bright curtain extending from near Cape Barne towards Mount Erebus, and not more than 30° up.
2.50 A curtain arc from N. to S. over Mount Erebus. In the W. two short curtains were situated high in the W., sloping down steeply to the E.; reported to appear to be dipping to earth.
From this date no aurora was reported for some time. This was, no doubt, due largely to the following causes:—*(a)* A long period of obscured sky; *(b)* bright moonlight; *(c)* daylight was now strong during the day. It is, however, unlikely that there was any striking auroral displays throughout this period.
15th, 6.00 Part of a curtain 20° up in the N. Several detached streamers more to the E. After this observation was obscured by daylight.
17.15 As the daylight waned auroral streamers were seen over the N. slopes of Mount Erebus.
17.45 } Long streamers rising over the N.E. horizon.
18.30 } Gradually several nebulous bands appeared just above the horizon in that direction.
19.30 A few streamers remaining.
18th, 2.00 Aurora reported.
3.15 A curtain to the N.E. and E. The display was low on the horizon, and at no time was it very bright. The excitation appeared to travel in waves from the S.E. A glow on the horizon behind Mount Erebus indicated an extension of the display to the S.
3.30 Conditions as last reported.
4.00 Only isolated streamers remain as remnants of the above curtain. The greatest intensity was in the E.
17.30 A few short and very faint streamers visible in the N.E. A nebulous aurora on the highlands of Ross Island to the N.E. Several faint streamer-patches to the S. of Mount Erebus as far as S.E. by E.
18.20 Aurora on the N. highlands of Ross Island and a patch of luminous nebula on the horizon line.

18th, 20.15 No definite aurora, only a very faint luminosity surrounding the slopes of Mount Erebus.

22.30 A nebulous auroral patch on the horizon due E. A faint luminous glow on the horizon-haze 10° up in the W. and S.

19th, 15.00 A curtain seen from Hut Point to the S.E.

17.40 Aurora commenced in the S.E. as a faint curtain of thin streamers. The streamers were very high, reaching 25° above the horizon in the vicinity of Mount Erebus. The streamers became stronger and black lines appeared to be a real phenomenon; they were distinctly darker than the general sky, and visible for two or three minutes only.

18.30 The display in the E.S.E. continued and the curtain rose 15° above the horizon, and appeared to trend S. by W. A long curtain eventually formed a semicircle around the E. and S. of Mount Erebus. Faint streamers rose occasionally above the summit of the mountain, and associated with these were black rays. After 18.30 only a very little aurora remained on the N. slope of Mount Erebus.

19.45 Aurora almost completely absent. A very faint luminous glow over the Ross Island highlands, and an almost invisible streamer rising above the horizon in the E.N.E.

20.10 Aurora becoming stronger.

20.20 An aurora of the first magnitude along the Mount Erebus slopes extending from N. to S. Streamers strongly developed and rising to 45°. Each of the streamers as it developed first established itself above in great brilliance, then extended downwards and appeared to drop some of its luminescence. The excitation travelled from N. to S., with very little body-movement, but an apparent creep towards the N.W. The highest streamers uniformly appeared following the outline of the backbone of Ross Island. When at its brightest the curtain showed a crimson lower selvage. There was even a coloured border faintly seen on some of the vertical streamers (colour banding in vertical direction).

20.50 A curtain composed of a succession of isolated high streamers appeared to trend N.N.W. across the eastern sky 15° up.

21.15 A curtain 25° up in the E. appeared to trend N.W.

22.00 A curtain seen on the horizon from N.N.E. to S.S.E.

23.00 A faint glow over the E. horizon. The curtains seen earlier in the evening appeared to have retreated to the E.

20th, 00.40 A bright curtain extended from over Cape Barne to a point 60° up E. of the zenith and concave on Mount Erebus. A second curtain appeared somewhat E. of the main one, also a small bright branch showed up over Cape Bird.

2.00 A curtain extended from N.W. to S. Patches of curtains in the N., E., and S. One high streamer in the N.E. rising to a height of 30°.

20th, 4.00 An auroral glow on the S.E. horizon. A bright streamer in the zenith. Several patches of nebula and small curtains in the W. and N.

17.15 Daylight expiring in the W.N.W. A faint fog formed on the N. highlands of Ross Island; this resembled the luminous haze frequently observed in that direction when the condition of darkness was favourable.

18.00 The twilight was now less, and by looking forward and staring sideways faint streamers could be detected in the faintly luminous fog along the slopes of the N. highlands of Ross Island. Looking straight at the phenomenon, nothing was specially noticeable excepting a faint greenish-white luminescence. After waiting for a few minutes, the best defined of the streamers brightened up for the space of a minute, so that it could be distinctly seen when looking directly at it. Apparently a fog was forming accompanying the falling temperature, and this appeared luminous against the darkness of night. The faint streamers visible to the strained eye appeared to be rising from amongst this, and formed a connecting link with the normal aurora. Or were the streamers rising from behind the fog?

18.30 The luminous haze more apparent.

20.00 A luminous haze enveloped the whole of the slopes of Ross Island. Minute spicules of ice were falling from the atmosphere. The haze had now settled down everywhere, and we appeared to be enveloped in a faintly luminous fog.

21.00 The haze persisted, but no definite auroral streamers were visible.

22.00 The conditions remained the same, excepting for the addition of a faint curtain in the sky to the E.

23.15 Two strong parallel curtains; one in the zenith, the other 30° E. of the zenith, extending from the N. horizon to a point somewhat S. of Cape Royds; trend, N. and S. A body-drift carried them somewhat W. and N. of the zenith in ten minutes.

21st, 17.30 Daylight obscured any auroral effects that may have otherwise been visible. No fog on the slopes of Ross Island.

18.15 No aurora observed.

20.45 A great auroral display in progress in the S.E. portions of the heavens. Most prominent was a great curtain extending from above Mount Erebus towards the S.W. by S., reaching the S.W. horizon. The highest elevation was 20°. Another faint curtain appeared parallel just to the N. of the zenith. Along the northern highlands towards Cape Bird a streamer display was in progress. The centre of the display was Mount Erebus, where the whole sky was a thin veil of auroral haze with nebulous knots scattered through it. A few minutes later a curtain ran out towards the hut from the great centre over Mount Erebus. A

21st. patch of nebulous auroral glow remained fixed in position on the E.N.E. horizon for half an hour; this appeared even to extend below the horizon line. A great blaze of nebulous aurora descended on to the northern slopes of the cone of Mount Erebus, appearing even to haze the horizon. During all this time the whole top of Mount Erebus was ablaze with aurora, high streamers appearing and quickly breaking down into nebula. A tiny cloud immediately above the cone appeared to be the chief centre of illumination. The luminosity increased around it, being a maximum against the black edge of the cloud itself. Streamers rose from the upper surface of the cloud, and a nebulous glow intervened between the cloud and the mountain top. The great curtain which formed the dominant feature of this display remained fairly steady, but exhibited a slight body-drift to the S. Another great curtain ran out parallel and somewhat S. of the former. The excitation came from the N.E.

21.30 } The long curtains contracted their southern ends
21.40 } on to Mount Erebus, developing into a great paraboloid, with apex directed to the S.S.W. away from the mountain, and some 45° in azimuth from it. The luminosity gradually contracted from the mountain and concentrated at the apex of the curved band, there fading into an auroral haze.

21.45 A glow seen on a dense cloud-bank 10° up in the S.S.E. Faint streamers descending on to Mount Erebus.

22.00 Streamers rising from a glowing cloud-bank to the S.E.

22.10 This display was probably some distance behind the cloud. A faint streamer 30° up to the E.N.E. A luminous haze now enveloped the horizon.

22.45 A curtain in the N.

24.00 A haze filled the atmosphere, so that smaller clouds obscured. A curtain appeared trending somewhat E. of N., and extending from the N. to a point 60° up in the E.S.E.

22nd, 6.00 An auroral glow over a belt of clouds in the S.E.

18.30 No aurora seen. The sky was not sufficiently dark to see any but the brightest display.

19.30 Streamers descending in the direction of Mount Erebus, apparently eastward of it.

20.00 Auroral glow on the horizon from E. to S.E. A high streamer descending apparently on to Mount Erebus.

21.00 A faint nebulous curtain stretching in a S.W. direction from Mount Erebus to the far W. A luminous display on the horizon from E. to S.E.

21.30 A great curtain of considerable brilliance, commencing in the N.E. and extending to the S.W. for some distance on the W. side of Mount Erebus, then swinging round and completing a large part of a circle around the mountain. At the same time streamers appeared in the S.E., and,

22nd. associated with a luminous haze, hung above the highlands to the N.N.E.

22.00 A long nebulous curtain, commencing just N. of Mount Erebus, extended far to the W., trending in a S.W. direction.

23.00 A nebulous auroral display over Mount Erebus.

24.00 A streamer 30° up in the N., and several dull patches near the horizon between E. and S.E. The display this evening was generally similar to that of the preceding evening, only less bright.

23rd, 00.30 Faint auroral streamers over Cape Bird; one in the N. An auroral patch on the N. slopes of Mount Erebus. A bright luminous haze now extended 20° up around most of the horizon, chiefly from S.W., S., E., and N.

2.00 Aurora stretching from N. to S.E. Sky overcast in the evening.

24th. Sky overcast.

25th. Overcast in the early morning hours, clearing somewhat in the evening.

20.00 An auroral glow in the N.N.E.

21.00 The glow still visible.

22.00 A faint curtain near the horizon, extending from N. to N.N.E.

23.00 A glow visible to the N. by E.

24.00 Two long nebulous arcs, trending N.N.E., extended across the sky; one from a point 15° up in the N.N.E. to the S.E., the other from the direction of the top of Mount Erebus towards the S.E. These curtains were bowed on Mount Erebus.

26th, 2.00 An auroral glow to the S.E. behind Mount Erebus, and to the N.N.E., reaching a height of 15°.

3.30 Two nebulous curtains, trending to the S.E.; one 60° above the horizon, the other close to the S.E. horizon. The lower one showed brightest, and was of a dull-reddish colour (probably owing to twilight affecting the eye).

4.00 A luminous glow and nebulous patches extending from N. to S.E. In the E.S.E. this extended to a height of 30°.

17.45 Daylight still strong in the N.W., and only first magnitude stars visible. A thin veil of haze hung over the Ross Island highlands, so that by 18.00 the mountain could only be seen by the light of the aurora behind it. A very bright curtain was observed; this extended in a nearly straight line, trending about N.W., and appearing to be on the near side of Mount Erebus and about 20° above the horizon. In azimuth it extended from N.N.E. to E.S.E. Faint streamers rose 10° above the base of the curtain; these trembled as the excitation travelled across them. The excitation travelled towards Mount Erebus, apparently from the N. at the N. end and from the S. at the S. end. There was also visible a passage both ways of excitation from the brighter portions of the curtain. As the luminosity waxed and waned it spread outwards

26th. from certain brighter centres. The original straight curtain slowly crept round at the S. end until definitely bent in a quadrant around Mount Erebus on the S.W. side. The N. end remained steady, while the S. end contracted on the mountain.

18.10 The S. end appeared to touch the mountain, and thereafter the intensity waned. During this time the curtain had drifted to the E.; it continued E. until the lower edge reached within 6° of the horizon, then rose a little and brightened up. In its earlier stages several streamers dropped below the curtain, apparently in the vicinity of the mountain; also the curtain appeared to make special displays in the direction of the cone of Mount Erebus. When at its brightest this curtain showed a variety of colour. The lower selvage was red, passing above into yellowish-white, and finally greenish-white. The whole appeared yellower than usual, probably due to twilight.

19.45 An auroral glow hung over the N. highlands of Ross Island.

22.00 A faint nebulous band 9° up stretching from E.S.E. to E. Watch kept till midnight, and nothing more noted than an auroral haze on the N. highlands of Ross Island.

27th. 1.15 A faint patch 20° up in the N.E.

2.00 Two parallel bands in the N.E., trending N. by W.

2.30 Two faint nebulous bands crossed the sky somewhat E. of the zenith, extending from 25° up in the N. to a point past the zenith in the S.; trend, approximately N. by W. A faint patch of nebula 25° up in the E. by S.; a few minutes later one main band appeared 45° up in the E., trending as before.

4.00 Faint auroral streamers in the E. Much cloud now came over the sky, obscuring observations. Very little aurora in the evening, though a faint haze on the Ross Island highlands.

22.00 Very faint streamers in the N.E.

22.25 Faint auroral streamers in the N.W.

22.30 A faint streamer 40° up in the E.

22.35 A very faint disjointed curtain in the E.

28th, 1.00 Luminous edge on a cloud low down to the S.E. Minute ice spicules falling from the sky. Sky clouded in the evening.

29th. Sky overcast in the morning and thick snowdrift in the evening.

30th. A thick blizzard, clearing at 22.00.

31st, 1.00 Auroral streamers of great height rising towards the zenith. A nebulous mass of aurora in the zenith.

2.00 Aurora in the W.

4.00 Aurora in the N.

23.00 Medium strong curtains, trending N.N.E.; one extending from the zenith, the other from 45° up to the E. towards the N. The more easterly one was the stronger.

24.00 A faint curtain across the zenith, trending N. and S.

September.

1st, 1.00 An arc trending approximately E. and W., 30° up in the S. A luminous cloud with streamers rising from it low on the S.E. horizon below the arc.

2.30 Aurora fairly bright in the zenith and N.E.

3.30 A faint steamer-curtain in the N.N.E.

Overcast at 6 a.m. and snow falling.

2nd, 00.30 A nebulous glow behind a cloud to the N.W.

2.00 A nebulous aurora in the N. from the horizon to the zenith. Odd patches of auroral nebula in the N.E. and above a dark cloud in the S.E.

4.00 A nebulous aurora in patches to the E.S.E. During the evening the sky was clear for the most part.

20.00 An irregular auroral patch on the S. side of Mount Erebus, just below the summit, in the position where a condensation cloud was seen earlier in the evening.

22.00 Aurora absent. A mist formed and the sky became overcast.

3rd, 2.00 An auroral knot in the W. Drifting snow during the day. In the early evening observation showed the absence of aurora.

23.00 A faint curtain over the zenith, trending from the S. to the zenith, then to the N.N.E. Third-order stars only visible on account of the moonlight (half-full).

4th, 1.00 A streamer-curtain seen faintly in the moonlight, trending N. and S. over the zenith.

1.30 Two parallel curtains close together and very steady.

2.00 An arc from N. to S.

In the evening the moon bright, so that only the largest stars visible and aurora further obscured by clouds.

5th, 2.45 Strong radiating cirro-stratus clouds developed about this time from the E.S.E. to the N.W. Simultaneously two auroral curtains became developed, trending about N.N.W. The westerly one extended from the N.N.W. to the zenith; the easterly one extended from the N. by W. to a point some 30° E. of the zenith. The latter was the brighter of the two curtains. They appeared brightest between the cloud-belts, between which they were scarcely visible. The excitation travelled from the N. ends. Both curtains drifted slowly N.W., the direction of the wind forming the cloud-radiant.

Long daylight, moonlight, and thick weather all co-operated for some time to mask auroral phenomena.

12th. Faint aurora noted after midnight.

13th, 0.10 A very bright small curtain-aurora to the N. of Mount Erebus at the same height as the top of Mount Erebus, concave towards Cape Bird. Also a long straight band, about 15° above the horizon, extended from Cape Barne to the S. side of Mount Erebus; this had long streamers, extending for a height of 5°. At the time the moon was bright.

15th, 0.10 A curtain with long streamers extended from the horizon near Cape Bird in a N. and S. direction, reaching a point 80° up E. of the zenith, where it faded out. Slow body-drift to W.

0.35 Fragments of the same curtain persisted; also detached streamers near the zenith.

1.15 Scattered streamers over large part of the sky; also an auroral glow on a low cloud-bank extending from S. to E.

18th, 1,00 A high streamer low down in the N. by W. Strong moonlight.

20.00 Mount Erebus smoke travelling to due W., and a peculiar whitish luminescent appearance of the smoke-bands, rather suggestive of aurora. At the same time a faint auroral band from near the E. horizon to a point 60° up in the S., more than half-way across the sky.

22.00 } Traces of aurora noted N. of Mount Erebus and
23.00 } a faint band trending E. by S.

24.00 Faint streamers most distinct to the N. of Mount Erebus; also a glow on the N. Erebus highlands. Even at midnight now there is a daylight glow in the S., with pink near the horizon.

19th, 22.00 Strong aurora on horizon N. by W. to E.N.E. Streamers rising from brighter bands on horizon. Although not very brilliant to witness, must be strong, as considerable twilight in sky.

23.30 No aurora visible.

20th. Drifting snow obscured view.

21st, 23.50 Several nebulous bands, somewhat stronger than the Milky Way. The main one, originating in the S.S.W., passed over the hut (zenith), then turned to the N.E., over the shoulder of Mount Erebus. Another patch extended from near the zenith in a N.W. direction. A quantity of faint auroral nebula in the E. The main band under observation appeared to be very stationary, with suggestion of slight movement to the N.W. Strong wind still blowing. Twilight obscured all but larger stars. Strong glows on cloud-patches seen earlier in the evening.

October.

2nd, 0.20 Blizzard conditions which have prevailed for several days now ceasing. A strong nebulous auroral arc across the sky from slightly W. of S. to the zenith, and then bending slightly N.N.E., passed far to the N. In half a minute it contracted, became more bowed on Mount Erebus, and appeared to travel slightly to the S.E. Twilight so strong that only ten or twelve stars visible.

After this date indistinct auroral phenomena were observed on several unstated occasions, notwithstanding strong twilight and considerably thick weather.

II.—SUMMARY.

1. Frequency in Relation to Sun-spot Cycle.

The aurorae logged by the "Discovery" Expedition from its base, twenty-two miles to the south, were much more scant than ours. Some allowance should be made for the difference in locality and also because of the fact that we made a special feature of the auroral observations. Making every necessary allowance, it seems certain that there was a real paucity of auroral phenomena during the stay of the "Discovery" Expedition.

The year 1908, when our observations were made, was one of abundant sun-spots, though not an actual maxima period. During the years 1902-1903 but few sun-spots occurred. According to Wolfer's lists, the following sun-spots were observed:—

Year.	*Sun-spots.*
1902	5·0
1903	24·4
1908	48·5

The "Discovery" Expedition found aurorae more prevalent during 1903 than during the year of fewer sun-spots, 1902.

The connection between sun-spot and aurora frequency is therefore borne out.

2. The Annual Variation of Frequency.

On account of continuous sunlight during December, January, February, and the greater part of October and March, no aurorae were visible during those months, with the exception of odd streamers logged towards the end of March and early October. During the months of May, June, July, and August, when the sun remained continuously below the horizon and when at the most but a twilight distinguished mid-day, auroral phenomena were seldom absent from at least some part of the sky. Even during the remaining months the darker hours were always accompanied by displays, some of which were the finest noted during the year. Occasional aurorae were seen during bright twilight, indicating that the phenomena continued, though most of the effects would be too weak to overpower the daylight. Each day as evening closed in we invariably expected to witness aurorae as soon as the daylight had faded sufficiently to allow of delicate phenomena being noted.

Nevertheless, there did appear to be a real direct effect of daylight upon auroral frequency. Considering the dark

hours only during which time any auroral phenomena would be visible there was, generally speaking, an increase in auroral intensity for several hours after that immediately succeeding twilight. The hour of maximum frequency is remote from the daylight hours. With regard to the detection of a variation in the quantity of auroral phenomena noted month to month, making due allowance for obscuring causes, such as daylight and blizzards, no great difference was observed. It was remarkable, however, that whereas during April, May, and August some of the most brilliant were seen, aurorae were never entirely absent for a day during June and July, though the majority of the displays were much calmer and localized than during the preceding or succeeding months.

3. Auroral Storm Periods.

It is generally the case that when brilliant aurorae are observed notable auroral phenomena are witnessed on several preceding or succeeding days. At Cape Royds this was notably the case. The most strongly-defined displays occurred during periods of two, three, four, or five consecutive days of remarkable auroral activity. As examples, may be mentioned the bright aurorae of the 1st, 2nd, 3rd, 4th, and 5th of June, the 19th, 20th, 21st, and 22nd of August, the 18th, 19th, 20th, and 21st June, the 22nd, 23rd, and 24th of May, and the 20th, 21st, and 22nd of April.

Furthermore, not only was there a bunching of the days on which the more notable auroral effects were observed, but on each day at a corresponding time manifestations peculiar to the period transpired. For example, during the afternoons of the 2nd, 3rd, 4th, and 5th of June bands ran out across the zenith in a nearly E. and W. direction; at other times such bands were quite a rare occurrence, so that their repeated appearance at this time must have special significance. On the three successive nights of the 19th, 20th, and 21st of June striking circular and elliptical aurorae took place in the eastern sky. Again, on the 19th, 21st, and 22nd of August, auroral curtains formed in sweeping curves, whilst at other times straight or but slightly-bowed bands and curtains were the general rule at Cape Royds.

Although undoubtedly there are to be expected several agents co-operating to produce auroral phenomena, it is undoubtedly owing to a single factor that such periods of auroral maxima are determined. Assuming that aurorae are directly produced by the radiant energy proceeding from a sun-spot, such a succession of auroral manifestations would be expected during the few days that the portion of the sun's surface containing the particular spot is turned towards the

earth. By reason of the sun's rotation the sun-spot advances, culminates, and then recedes; such cases would be expected to be connected with terrestrial aurorae exhibiting the same phases. Should a sun-spot be suddenly created on the surface of the sun directly facing the earth, auroral phenomena would appear without advance indications. Examples such as are required by the above regular movements of sun-spots are commonly witnessed.

Following up the argument of sun-spot bombardment, we should expect a recurrence of auroral phenomena at an interval of the rotation period of the sun.

On looking over the journal, it appears that in some cases this does happen to be the case. For instance, the aurora of April 27 was followed by one—a sun's rotation period later in May, and again, though somewhat less prominently, in June. Following the bright aurorae of the early days of June was a demonstration—a sun's rotation period later at the end of the month. That of May 23 may be regarded as appearing again on June 18. There appears, therefore, to be some ground for supposing these to be repetitions; at any rate, the suggestion should not be hastily dismissed, for at the best such a cycle would not be likely to be prominently evidenced in scanning an auroral record. There are many circumstances which would exclude the possibility of recording the reappearance of auroral phenomena connected with a particular sun-spot after an interval of a sun's rotation period.

Chief amongst these is the fact that only a proportion of sun-spots continue to exist for the time necessary, and even those may be too feeble to produce auroral phenomena.

Secondly, co-operating circumstances may not be favourable. Again, the meteorological conditions may be unfavourable for observing. In the latter case, as the relation between auroral phenomena and earth magnetism is not yet finalized, it would be unsafe to rely upon magnetic records.

4. Diurnal Variation.

Distribution of Auroral Phenomena in Relation to Time of Day.—Account is taken only of the months June, July, and August, because of their more complete record. Text fig. 2 shows graphically the relative average amount of visible aurora seen at Cape Royds throughout the twenty-four hours of the day (see text fig. 1).

The flattening at noon is at least partly due to the obscuration of faint effects by twilight.

The maximum daily aurora took place between 2.45 a.m. and 3.0 a.m. During the afternoon, between 4 p.m. and

5 p.m. there was a minor rise in the curve of frequency; also between 8 p.m. and 10 p.m.

There was a real decrease in auroral frequency between 5 p.m. and 8 p.m. The indication of this on the curve is

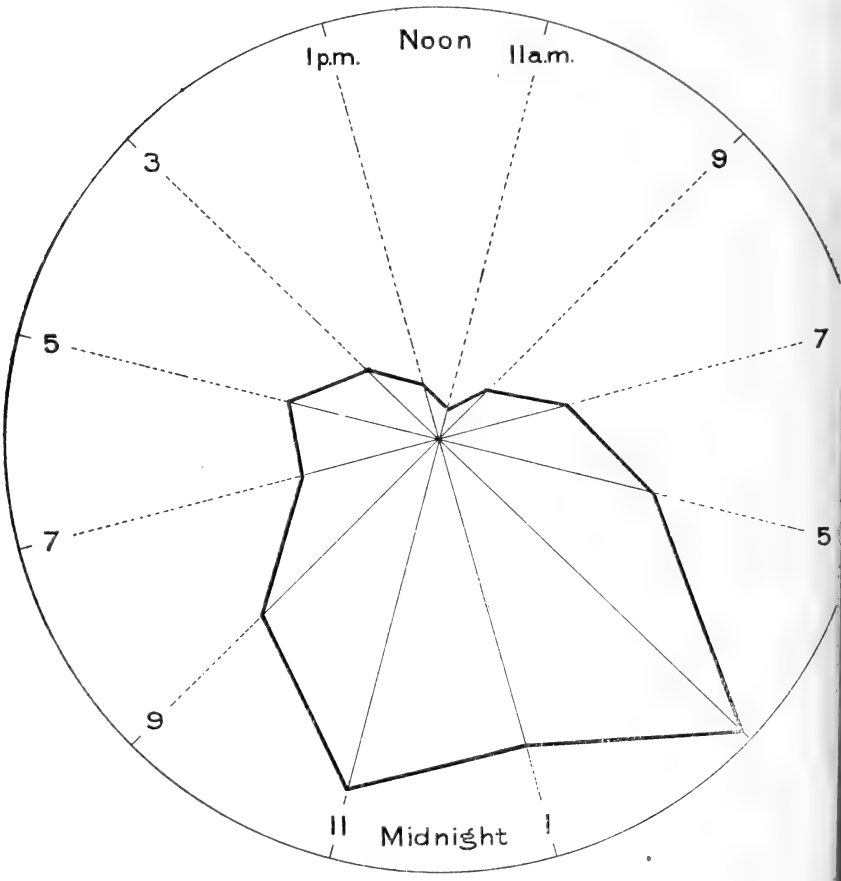

Fig. 1.

Daily Time-distribution at Cape Royds.

Graph to illustrate the relative frequency of auroral phenomena at different hours of the day. Radius vectors on scale of 3/80th inch equals one hour's display.

possibly slightly further accentuated by the fact that an imperfect watch was kept during the dinner-hour, which occurred between 6.30 p.m. and 7.30 p.m.

5. Auroral Frequency at Cape Royds in Relation to Geographic Direction.

The accompanying diagram (plate xx., facing page 206) illustrates the relative frequency of auroral phenomena seen in

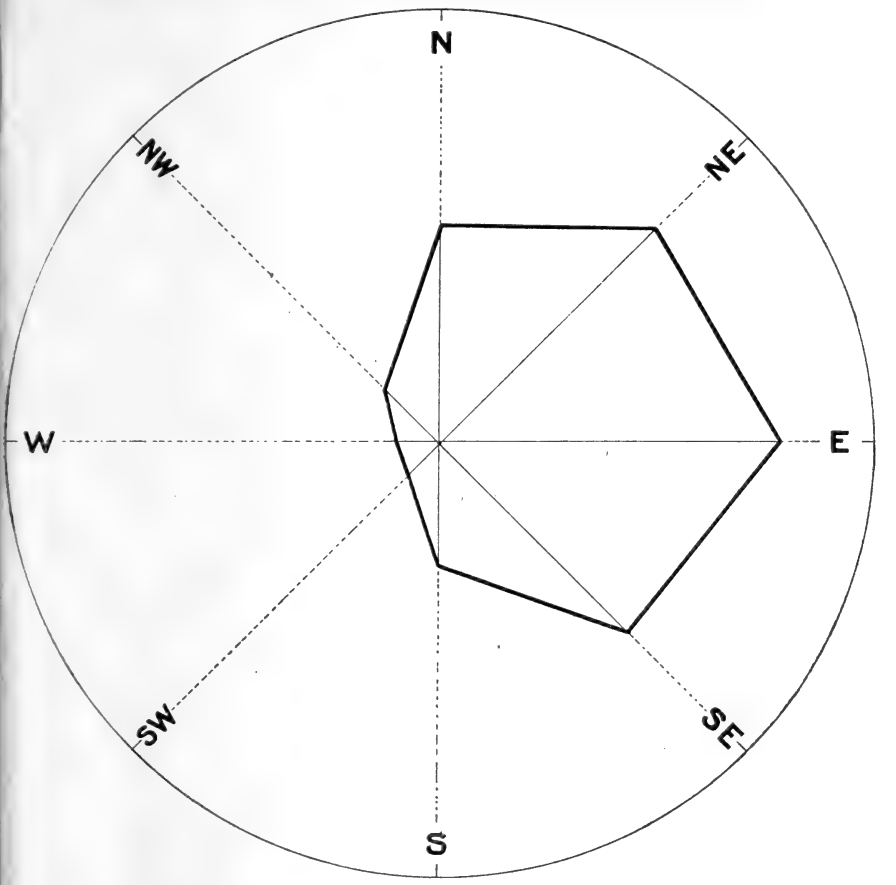

Fig. 2.

Distribution in Azimuth of Auroral Phenomena at Cape Royds.

Graph to illustrate the relative frequency of aurorae seen at Cape Royds in relation to geographical direction. Radius sectors to scale of 1/40th inch equals one hour's display.

relation to azimuth bearing. Figures for June, July, and August only have been considered. No account is taken of auroral glows on the horizon or reflected from clouds (see text fig. 2).

The scarcity of auroral phenomena in a western direction (over the plateau of South Victoria Land) and its frequency in the Eastern skies (over the Ross Sea and the flat, floating barrier ice) are specially noticeable.

Auroral phenomena, as seen from Cape Royds, ar wn to be most frequent between N.E. and E.

No doubt the curve is somewhat flatter in the N. than it should be, for it is likely that the short twilight at noon obscures some faint effects.

6. Diurnal Frequency and Geographic Direction considered Conjointly.

Account is taken only of the months June, July, and August because of their more complete record. The method of observation practised does not supply data sufficient to make an accurate statement of the exact number of hours during which auroral phenomena were observed in any particular portion of the heavens.

After a careful analysis I have, however, been able to prepare a diagram (pl. xx.), which indicates the periods during which auroral phenomena were observed in the various portions of the heavens. The figures represent hours, but are to be regarded as approximately correct in a comparative sense only. The absolute time, it is believed, is really approximately correct, but may range from once to twice the figures given.

Auroral glows upon the horizon are not included. The periods chosen are two-hourly. The sixteen principal geographic (true-bearing) directions and the zenith are considered. In the case of the latter, aurorae occurring within 20° of the zenith-point are regarded as appearing in the zenith.

The somewhat smaller values for E.N.E. and E.S.E., as compared with those of N.E., E., and S.E., suggest that in logging the more fundamental points of the compass have received from the observer more than their fair share of favour. The curves show at a glance the hour of maximum auroral frequency for each case, and it is to be noted that, generally speaking, this bears a specific relation to the particular portion of the heavens under consideration. For instance, in the S.E. and N.W. the maximum occurs at 3 a.m.; in the S. and N. at midnight; etc.

Making due allowance for the obscuring effect of daylight and for the daily average maximum and minimum frequency, auroral phenomena, as seen at Cape Royds, favour the portions of the sky which are *(a)* directed towards, *(b)* directed away from the sun, having regard for the position

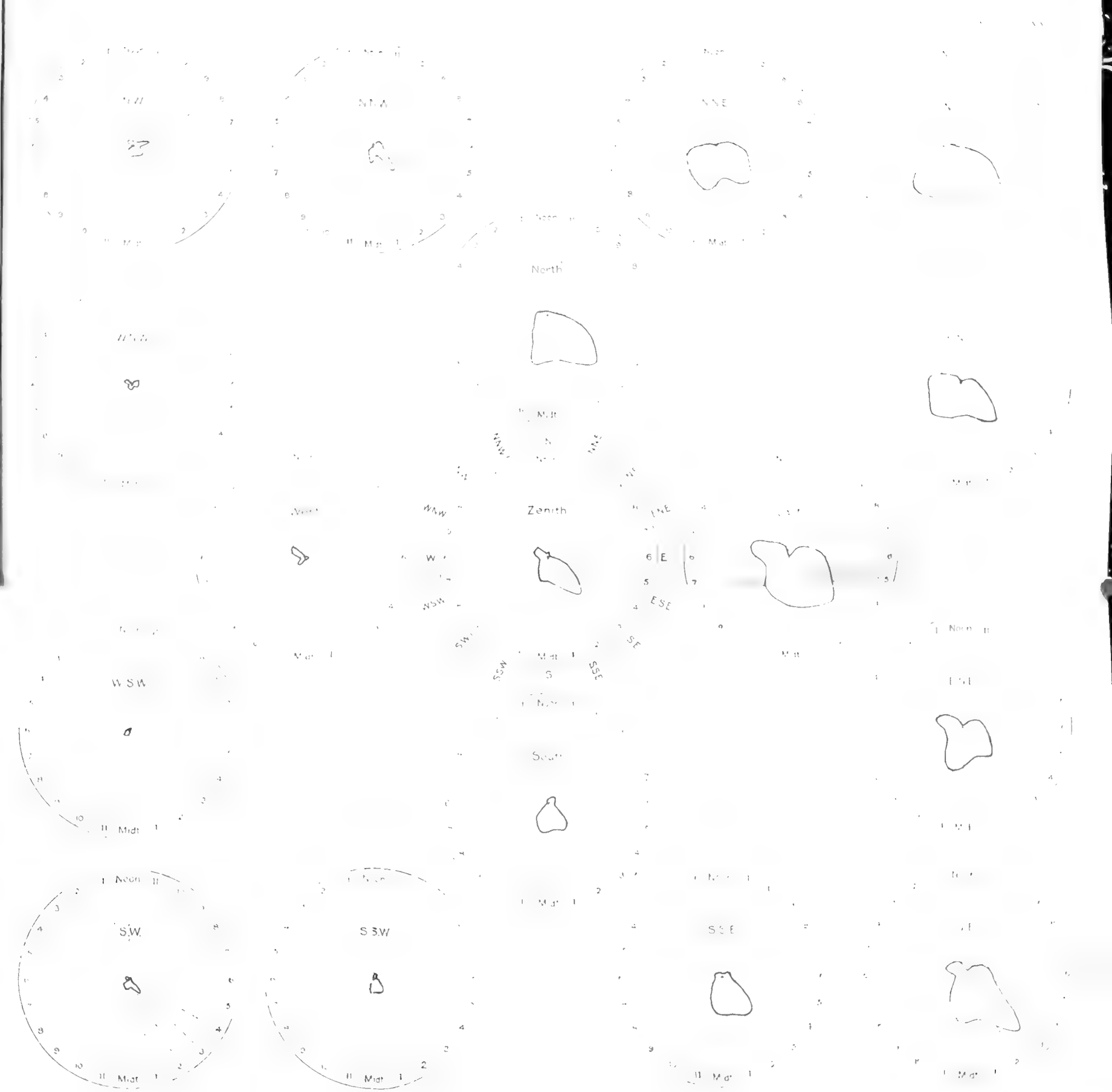

Diagram to Illustrate Time and Place Distribution at the Cave Rocks Station.

Graphs to illustrate annual frequency in relation to the hour of the day considered for the seventeen principal directions in the breeze. Radius vectors plotted to relative frequency values of observed placements

of the latter at the time of observation. As an example, it may be stated that in the neighbourhood of the hours of 6 a.m. and 6 p.m. aurorae are most likely to appear in the eastern or western skies. Of course, aurorae may occur in the east and west at other times of the day. The figures show, however, that an exhibition is more likely to occur in that direction than in any other at that particular time (see pl. xx.).

7. The Diurnal Variation in Trend.

Auroral displays at Cape Royds are distinguished by the large proportion of curtains traversing the heavens in a linear or nearly linear direction. A remarkable daily sequence was observed in their trends. Always (on the average) they appeared directed approximately towards the sun. Thus should a curtain persist for any length of time it was noted always to exhibit a slow rotational movement counter-clockwise. This swinging movement was more conspicuous sometimes than at others. On rare occasions a swing of as much as 20° was observed in a few minutes; at other times this would occupy several hours. Generally speaking, the swing was fairly regular.

Except in simple cases, where the curtain crosses the sky in the vicinity of the zenith, considerable experience is required in determining the trend (geographic orientation), and it is quite certain that erroneous statements in this regard are usually logged where observations are made by untrained observers. Although most of the logging at Cape Royds was made by a few capable observers, a small proportion of the statements are likely to be in error in respect to trend. In the case of bands and curtains near the horizon it is probable that the directions stated are frequently in error; in other cases they may be correct, but refer to a portion of a curved form whose character is obscured because of its low elevation.

For this reason, in the following analysis, account is taken only of those appearing above 60° in altitude. Further bands, etc, showing any marked changes in direction will be omitted, for obvious reasons. Finally, due weight has been given to those observations made by the more competent observers. An analysis of the log resulted in the accompanying statistics. The direction is stated as N. and S., E. and W., and in all other cases the direction from the zenith is indicated: for instance, N.W. means a trend from N.W. to S.E.

Trend of Curtains.

April.

A.M.	P.M.
7, 2.00, N. and S.	21, 10.15, N. by E.
	20, 11.00, N. and S.

May.

A.M.		P.M.	
23,	11.00, N. by E.	25,	5.00, E. and W.
P.M.		24,	5.30, N.E. by E. (mean)
24,	3.00, E. and W.	25,	8.30, N. and S. (roughly)

June.

A.M.		P.M.	
25,	0.15, N. and S.	25.	2.00, N.W. by W. (mean)
25,	0.30, N. and S. (approx.)	25,	2.40, N.W.
25,	1.00, N. by W.	25,	3.00, N.W. by W.
25,	1.15, N.N.W.	25,	3.10, W.N.W.
4,	1.15, N.W.	2,	3.30, E. and W.
25,	1.30, N.N.W.	4,	3.30, W. by N.
7,	2.00, N. and S. (roughly)	25,	4.00, W. by N.
9,	2.00, E. and W. (roughly)	3,	4.15, E. and W.
25,	3.00, W.N.W.	25,	4.30, W.N.W.
25,	3.15, W.N.W.	4,	4.30, W. by N.
25,	3.30, W.N.W.	5,	6.00, W.N.W.
23,	3.30, N.W.	25,	6.00, E. and W.
26,	4.00, N.W.	19,	7.40, N.E. by N.
25,	7.45, N. and S.	5,	7.45, E. and W.
25,	8.15, N. and S. (bowed)	29,	8.00, E. and W.
4,	9.45, N. by E.	22,	8.00, E.N.E.
23,	10.00, N.E.	4,	8.20, E.N.E.
24,	10.15, N.W. (fragment only)	4,	9.15, N.E.
29,	11.30, N.W.	5,	9.45, N.E. by E.
5,	12.00, N. by W.	21,	9.50, N.E.
P.M.		8,	10.00, N.E.
25,	1.30, N.W. by W. (mean)	20,	10.30, E. and W.
4,	2.00, W. by N.	24,	11.15, N. and S.
18,	2.00, N.W.	6,	12.00, N. and S. (approx.)
23,	2.00, N.N.W.		

July.

A.M.		P.M.	
9,	0.30, N. and S.	8,	8.30, E. and W. (roughly)
8,	0.30, N. and S.	23,	8.45, E.N.E.
21,	1.45, N. and S. (roughly)	8,	9.45, S.S.W.
8,	2.00, N. and S. (roughly)	8,	10.00, N. and S. (roughly)
28,	2.00, N.N.W.	6,	10.15, E. by N.
21,	2.15, N.N.W.	6,	10.30, E.N.E.
8,	3.00, N. by W. (poor)	7,	10.30, N. and S.
18,	3.45, N.W.	1,	10.45, N. by E.
8,	5.30, W. by N.	20,	11.00, N.N.E.
8,	6.30, N.W.	8,	11.00, N. by E.
P.M.		24,	11.00, N. by E.
7,	12.30, N. and S.	23,	11.15, N.N.E.
7,	1.45, N.N.W.	18,	11.15, N. and S.
8,	2.00, N. and S. (roughly)	8,	11.30, N. and S.
6,	3.30, N.W.	21,	11.30, N. and S. (approx.)
9,	5.30, W.N.W.	25,	11.30, N. and S. (approx.)
6,	5.30, E. by N.	20,	11.30, N. and S.
19,	5.00, E. and W. (approx.)	7,	12.00, N. and S.
16,	7.45, E. and W. (approx.)	8,	12.00, N. and S.

August.

A.M.		P.M.	
27,	0.30, N. and S.	21,	8.45, N.E. by E.

20,	12.40,	N. by W.	2,	9.30,	E.N.E.
2,	12.45,	N. and S. (approx.)	2,	10.00,	E.N.E.
27,	2.00,	N. by W.	22,	10.00,	N.E.
27,	2.30,	N. by W.	2,	11.00,	N.N.E.
2,	2.30,	N. and S.	31,	11.00,	N.N.E.
26,	3.30,	N.W.	20,	11.15,	N. and S.
	P.M.		2,	12.00,	N.N.E.
4,	5.45,	E. and W.	21,	12.00,	N. by E.
26,	5.50,	N.W. (mean)	25,	12.00,	N.N.E.

September.

	A.M.			A.M.	
21,	1.00,	N. and S.	5.	2.45,	N.N.W.
1,	1.00,	E. and W. (poor)		P.M.	
4,	1.00,	N. and S.	3,	11.00,	N. by E. (mean)
4,	2.00,	N. and S.			

At a glance, it is noted that the trend at midnight and midday is usually N. and S., at 6 a.m. and 6 p.m. approximately E. and W. Between these hours there is a regular counter-clockwise swing. There is, therefore, a semi-diurnal period.

Considering the fundamental cause of this phenomenon, the semi-diurnal character of the period is likely to be only apparent, for such would be the case were the curtains always directed towards the sun.

After due consideration the following interpretation has been adopted: That at Cape Royds, in the case of steady, straight bands and curtains, they take up a position throughout the day approximately directed towards the sun. The period is therefore more truly diurnal.

There are many cases where auroral forms, otherwise similar to the generality of cases, seriously contravene the above rule. These are regarded as exceptions. An examination of the tabulated statement of trends shows that they agree with the rule stated to the following degree:—

Coincident	60	.....	51·7 %
Approximately coincident ...	38	.....	32·7 %
Divergent	9	.....	7·8 %
Directly opposed	9	.....	7·8 %

8. Relation to Lines of Magnetic Force.

As it has already been shown that the average trend of the arcs follows the sun round as the day progresses, there can be no hard-and-fast relation to the magnetic meridia. Much stress has been laid by observers in other parts of the world upon a relation in this connection; but such is not borne out by our observations at Cape Royds. There did, however, appear to be a subsidiary influence on the control and movement of arcs effected by the earth's magnetic field.

For instance, the drift (body-travel) of arcs was dominantly towards the Magnetic Pole. On occasions of powerful display, however, the arcs appeared, in the first instance, to drift towards the South Magnetic Pole; then apparent attraction gave place to repulsion after the culmination of the intensity; the later phases including a drift away from the Magnetic Pole.

9. Relation to Land Topography.

Many entries in the journal appear to illustrate a relation between auroral phenomena and topography. Arcs and bands stretching in straight lines over the sea towards Ross Island generally showed deflections where they passed vertically above the land. Very frequently curtains hung over Ross Island, showing a relation in form to the topography of the island itself. Curtains whose direction carried them across the highlands of the island often appeared to rise locally as if, in some measure, following the surface contour of the island. Bands extending as if hung over the backbone of Ross Island were very common, and usually, when the luminosity had died out elsewhere, streamers still persisted above the summit of Mount Erebus (13,300 ft.). Another favourite spot for isolated streamers was a location in the direction of Beaufort Island, apparently over it.

In the clearest possible manner this favouritism for certain geographical situations was illustrated. The curve of "Frequency" (text fig. 3), to which reference has already been made, illustrates the great paucity of aurorae over the continent and the abundance over the sea.

10. Relation to Meteorological Conditions.

There is certainly no simple relation between meteorological conditions and aurorae. Auroral forms of all kinds and varying intensities are to be noted in calm and in bad weather alike. Such evidence, however, does not dismiss the possibility of a connection, for in the first place, as the phenomena for the most part at least operate at very great heights above the earth's surface, meteorological conditions are no criterion of what exists above. In any case, at great elevations in the atmosphere the meteorological conditions are not likely to be subject to the rapid variations of the lower zones. It is likely that the *rôle* of meteorology in oral manifestations is the effect upon earth temperature and atmospheric potential and ionization, caused by extensive regional conditions even remote from the point of observation. For example, extensive calm periods, storm periods, or cloudy

areas in lower latitudes may assist to induce aurorae in the Polar zones.

At Cape Royds, in the case of very faint or sluggish aurorae, there did appear to be some relation to the existing local meteorological conditions. For instance, in certain calm weather, with north-easterly airs blowing, one walked out of the hut to observe with the assurance that certain effects would be visible, and it was usually so. However, much more extended observations would be required to establish this point.

11. Colour.

Normal aurorae of high latitudes are of a typical and constant somewhat greenish-yellow tint. That is conditioned by the predominance of the krypton line in its spectrum. Intense displays are accompanied by crimson and greenish tints. This journal contains mention of only about six cases where such colours were observed. The absence of frequent colouration effects indicates that the Cape Royds region, though auroral manifestations are very prevalent, is not a region of intense auroral storms.

In the case of curtains, as the intensity of the luminescence increases, a narrow selvage of crimson makes its appearance along the lower border. When more intense, the upper portions of the streamers may show a siskin or peacock green. That portion of the curtain between these limiting colours remains the normal aurora tint.

12. Suggestions in Conclusion.

Most of the characters of the *aurora polaris* are best studied by analysis and scrutiny of the regular weak effects which form the normal daily cycle in the Polar regions. Superimposed, and operating at irregular intervals, are auroral storm periods of intense displays. The circumstance of increased intensity leads to progressive changes in the character of the latter, and has the effect of concealing some of the more fundamental features.

Extra-terrestrial influences (*e.g.*, sun-spots) may be brought in to explain auroral storms, but the weaker effects are a regular feature of the Polar zones.

Recent experimenters—Birkland, and others—have given good reason to believe that a definite flow of electricity takes place along auroral arcs and curtains. The extremely small resistance to the passage of electricity in the tenuous upper atmosphere has been dwelt upon by C. T. R. Wilson. In the Polar regions this resistance would be expected to be less, for on account of the attractive force exerted on free ions

by the Magnetic Poles the atmosphere should there be more highly ionized.

The bombardment of the daylight hemisphere of the earth by the sun ionizes the atmosphere and increases its potential. Even the heating effect of the sun contributes by causing thermo-electric charges. Difference of potential may further be produced by the fact that water vapour condenses more readily upon electro-negative ions, entrapping them and carrying them down to the earth, thus leaving the upper air positively electrified. As cloud formation and rain precipitation are greatest in evening hours, this tends to a definite daily cycle. By such means an average difference of potential tends to be established between the daylight and dark hemispheres of the earth.

The fact that bands and curtains on normal occasions at Cape Royds usually followed a daily cycle, swinging round always directed from the daylight to the dark hemispheres, suggests that such are lines of current flowing to equalize the potential in the daylight and dark hemispheres.

In support of this suggestion may be mentioned that should such a flowage of electricity take place in the higher atmosphere the Polar regions are most favourable for it. Attention is drawn to the consideration that arcs from regions on the earth of prolonged sun bombardment to regions most remote (in time) therefrom are much longer round the earth in lower latitudes than are trans-Polar arcs.

Topography and the distribution of land and sea have a considerable influence on the permeability of the ether to "wireless" waves. So the fact that auroral arcs are not always mathematically simple and direct—indeed, that they seem to avoid certain regions and are crowded into others—is merely repeating experience in the transmission of "wireless" waves.

The existence of overhead currents flowing in arcs across the Polar regions from the daylight to the dark hemisphere would account for the diurnal swing of the compass.

DESCRIPTION OF PLATES.

Plate XIX.

Locality Map of the Observing Station at Cape Royds.

Plate XX.

Diagram to illustrate time and place distribution at the Cape Royds Station. The graphs illustrate auroral frequency in relation to the hour of the day considered for the seventeen principal directions in the heavens. Radius vectors plotted to relative frequency values of observed phenomena.

The Australian Ants of the Genus Aphaenogaster, Mayr.[1]

By William Morton Wheeler.

(Communicated by Arthur M. Lea.)

[Read July 13, 1916.]

Plates XXI. and XXII.

In 1858 Frederick Smith described from Melbourne, Victoria, under the name of *Myrmica (Monomorium) longiceps*, a very common and widely-distributed Australian ant, which was later referred by Mayr to the genus *Aphaenogaster*. It was subsequently placed in the subgenus *Ischnomyrmex*, Mayr, and recently changed to *Deromyrma* by Forel, because the type of *Ischnomyrmex (longipes*, F. Smith) proved to be a *Pheidole*. Mayr in 1876 described the male and female of what he believed to be *A. longiceps*, Sm., from specimens taken in Queensland and New South Wales. Although Smith's description is sufficiently clear to indicate the modern generic allocation of his species, it was far from satisfactory for specific identification, and confusion at once resulted when Forel, in 1902, distinguished two Australian forms of *Aphaenogaster*, one from Adelaide, South Australia, which he referred to Smith's *longiceps*, and another from Victoria and New South Wales, which he described as a new subspecies, *ruginota*. For many years Forel and Emery believed that there were two forms of *Aphaenogaster* in Australia, the typical *longiceps* and Forel's subspecies *ruginota*; but as Smith's and Mayr's descriptions might apply to either, Emery in 1913 sent specimens to Mr. Meade-Waldo, who compared them with Smith's type, which is still in the British Museum. From this comparison Emery concluded that the Queensland form must be the true *longiceps* and the more southern form the subspecies *ruginota*. He gave figures of the males of what he took to be the two forms, but the differences between them are insignificant. In 1915 Forel elevated his *ruginota* to specific rank, and pointed out the differences that separate it in all three phases from what he regarded as the true *longiceps*. Not knowing which of the

[1] Contribution from the Entomological Laboratory of the Bussey Institution, Harvard University. No. 116.

two had been described by Smith under this name, he proposed the name *pythia* for his own *longiceps*, in case *ruginota* should prove to be identical with Smith's type.

A study of a large number of specimens of *Aphaenogaster* collected during 1915 by myself in many localities in New South Wales and Queensland, and of many others recently loaned me for study by the Museum of South Australia, from Victoria, South and Western Australia, enables me to settle the matter under discussion. It happens that there are not only two, but *three* distinct, though superficially very similar species of *Aphaenogaster* in Australia, and that all three have had a share in the confusion. One, an undescribed species, which I shall call *barbigula*, ranges over Western and South Australia and eastward to the western portions of Victoria and New South Wales. I feel certain that this is the form called *longiceps* by Forel, when he is referring to specimens from Adelaide, Victoria, and Western Australia. In fact, some of my specimens from Victoria are from the same lot as some of those cited by Forel (Sea Lake, collected by J. C. Goudie). Of the two other species, one, extremely common and widely-distributed throughout the coastal portions of Victoria and New South Wales and the dryer portions of Queensland, corresponds to Forel's *ruginota;* the other, Forel's *longiceps*, seems to be rare and local, and is known only from Queensland and northern New South Wales. Suspecting that Forel and Emery had not interpreted Smith's *longiceps* correctly, I forwarded specimens of all three species to my friend, Mr. Horace Donisthorpe, who kindly compared them very carefully with Smith's type. He writes me that the type is undoubtedly what Forel called *ruginota*, and not what he called *longiceps*. Hence *ruginota* becomes a synonym of *longiceps*, Smith, and the rarer Queensland form. Forel's *longiceps*, which was unknown to Smith, must take the name *pythia*, Forel. That both of Emery's forms were *longiceps* is proved by his figures of the males, since the male *pythia* is quite different. Mayr probably confused both species. At any rate, his description will apply to the male and female of either, but as he introduced no new names his intepretation is now a matter of little moment. The female of *longiceps* had been previously described by Smith under the name of *Atta antipodum*.

There is some doubt concerning the subgeneric position of the Australian *Aphaenogasters*. Forel placed *longiceps* in the subgenus *Ischnomyrmex* because the male and female have only one cubital cell in the fore wing. When the type of *Ischnomyrmex* proved to be a *Pheidole*, he changed the name of the subgenus to *Deromyrma* and designated *A*

swammerdami, Forel, of Madagascar, as its type. This form and several other paleotropical and neotropical species have the head in the worker and female constricted behind to form a narrow neck, whereas another series, also with a single cubital cell in the wings (*cockerelli* and *albisetosa* of North America, *sagei* of the Himalayas, and *longiceps*), do not have the head narrowly constricted behind. Forel preferred to retain these species in the subgenus *Deromyrma*, because he attributed more value to the wing venation than to the shape of the head (Rev. Zool. Afr., 2, 1913, p. 350). Viehmeyer continued the subdivision of the genus *Aphaenogaster* by separating out the Papuan species *dromedarius*, *loriae*, and *quadrispina*, as a distinct subgenus, *Planimyrma* (Zool. Jahrb. Abth. f. Syst., 37, 1914). More recently Emery has carried the subdivision considerably further. He regards the Mediterranean species of the *testaceopilosa* group as constituting the subgenus *Aphaenogaster sens. str.* (with *sardoa*, Mayr, as the type). These forms have small females, with narrow thorax, which seem never to bear wings. The large series of circumpolar species allied to *subterranea*, Latreille, with large, winged females and two cubital cells, Emery places in a new subgenus, *Attomyrma*. The North American species, *cockerelli* and *albisetosa*, he assigns to another subgenus, *Novomessor*. Although the males and females of the Australian species and the Himalayan *sagei* have only one cubital cell, he prefers to place them in *Attomyrma* rather than in *Deromyrma*. While I agree that the Australian species should be removed from the subgenus *Deromyrma*, I do not believe that they should be assigned to *Attomyrma*. The three species form a very compact group, characterized not only by the presence of only one cubital cell, but also by their geographical isolation and the size of the female, which is much larger in proportion to the worker than in any of the other species of *Aphaenogaster*. They may, therefore, properly constitute a distinct subgenus, for which I propose the name *Nystalomyrma*, subgen. nov., with *Myrmica longiceps*, Smith, as the type. This leaves only the Himalayan *sagei* without a definite position. It may be placed in *Attomyrma*, as Emery suggests, especially as the female is only slightly larger than the largest worker forms.

It seems necessary to dwell at length on the taxonomic matters, because the three species of *Aphaenogaster*, and particularly *longiceps*, are among the commonest or most conspicuous ants in the *Eucalyptus* forests, and therefore familiar to all Australian entomologists. The species of *Nystalomyrma* are insectivorous, like most other species of *Aphaenogaster*, and live by preference in sand or sandy soil,

usually in moderately shady spots, where each colony makes numerous scattered or contiguous craters, often several inches in diameter, with very large entrance galleries, descending perpendicularly and deeply into the ground. These nests are often around the roots of trees, more rarely under prostrate logs or large stones. *Longiceps* and *pythia*, and doubtless also *barbigula*, which I have not seen alive, are nocturnal, so that although their earthworks are conspicuous objects in the "bush," they are quite deserted by the ants during the day. The colonies seem to be rather populous, but the individual workers are very timid. It is certainly astonishing that such small, slender insects should be able to build such extensive nests. At Koah, in Northern Queensland, I visited a piece of dry forest in which whole acres of the soil were covered with the craters of *longiceps*. These were larger and more compact than those seen in sandy localities in Queensland and New South Wales, and had very smooth, funnel-like entrances. At first I believed the nests at Koah to be the work of a distinct species, but the ants proved to be indistinguishable from typical *longiceps* in the other localities, so that the differences in the nests were probably due to differences in the soil. At Salisbury Court, near Uralla, New South Wales, while camping in the woods with Mr. W. W. Froggatt and his son, I was able to watch the workers of *longiceps* during the night, while they were busily bringing out their pellets of sand and earth and depositing them on the craters. The workers of *barbigula* have a true "psammophore" of long hairs on the lower-surface of the head, like many desert ants of various genera (*Pogonomyrmex*, *Cratomyrmex*, *Messor*, *Holcomyrmex*, *Myrmecocystus*, *Cataglyphis*, *Melophorus*, etc.), and therefore probably use this organ as a basket in which to carry out the moist sand-pellets. A note on the label in one bottle of this species received from the Museum of South Australia refers to its "nesting in sand." The following descriptions and figures will facilitate the identification of the Australian species of *Aphaenogaster*.

Aphaenogaster (Nystalomyrma) longiceps, F. Smith.

Pl. xxi., figs. 1-3; pl. xxii., figs. 1-4.

Myrmica (Monomorium) longiceps, F. Smith: Cat. Hymen., Brit. Mus., 6, 1856, p. 128, female.

Atta antipodum, F. Smith: *ibid.*, p. 166, female.

Myrmica longiceps, Lowne: Entomolgist, 2, 1865, p. 334.

Aphaenogaster longiceps, Mayr: Journ. Mus. Godeff, 12, 1876, p. 43, male, female (in part); Verh.: Zool. bot. Ges. Wien., 36, 1886, p. 359; Dalla Torre: Cat. Hymen., 7, 1893, p. 103.

Aphaenogaster(?) *antipodum*, Mayr: *ibid.*, p. 360, female.

Aphaenogaster antipodum, Dalla Torre: Cat. Hymen., 7, 1893, p. 98, female; Froggatt: Agric. Gaz. N.S.W., 1905, p. 21, female.

Stenamma longiceps, Froggatt: *ibid.*, p. 17.

Stenamma (Ischnomyrmex) longiceps, race *ruginota*, Forel: Rev. Suisse Zool., 10, 1902, p. 440, two females.

Aphaenogaster longiceps, subsp. *ruginota*, Emery: Boll. Lab. Zool. Gen. Agrar. Portici, 8, 1914, p. 181, fig. 1*b*, male.

Aphaenogaster longiceps, Emery: *ibid.*, p. 181, fig. 1*a*, male.

Aphaenogaster (Deromyrma) ruginota, Forel: Ark. Zool., 9, 1915, p. 75, two females and male.

Aphaenogaster (Attomyrma) longiceps, Emery: Rend. R. Acad. Sc. Ist. Bologna, 1915, p. 71.

Worker.—Length, 5-7 mm.

Head about one and one-quarter times as long as broad, as broad in front as behind, with feebly convex sides, rounded posterior corners and a pronounced, reflected occipital margin. Eyes rather small, convex at the middle of the sides of the head. Mandibles long, with rather straight external borders, their apical borders irregularly denticulate, with three larger teeth at the tip. Clypeus moderately convex, its anterior border broadly rounded and entire. Frontal carinae subparallel; frontal area large, triangular; frontal groove indistinct. Antennae slender; scapes extending about one-fourth their length beyond the occipital border of the head, their tips distinctly incrassated; funiculi with distinct 4-jointed club, and all the joints more than twice as long as broad. Thorax rather long and slender, pronotum slightly flattened above, rising posteriorly to the mesonotum, which slopes rapidly backward and is slightly concave anteriorly in profile, marginate on each side above and along its inferior border. Mesoëpinotal constriction abrupt and rather deep. Epinotum as high as long, its base horizontal and straight, forming a right-angle with the shorter declivity; the spines somewhat curved at base, slender and acute, less than half as long as the declivity, nearly as long as their distance apart at the base and directed backward and slightly outward. Petiole with a slender peduncle shorter than the node, which is rather high and rounded above, its anterior slope rising abruptly and perpendicularly from the peduncle. Seen from above, the node is longer than broad. Postpetiole a little higher than the petiolar node and somewhat broader. Legs long and slender; spurs of the hind tibiae very small.

Shining; mandibles subopaque, coarsely striated; clypeus and head above smooth and shining, longitudinally rugose

between the frontal carinae and eyes, the rugae diverging behind. Cheeks with coarse, elongate punctures. Mesonotum and epinotum subopaque and rugose-punctate, the rugae irregular on the sides and often transverse on the base of the epinotum; pronotum and declivity of epinotum smooth and shining, as are also the petiole, postpetiole, gaster, and legs. Antennal scapes and legs with sparse piligerous punctures.

Body, including the antennae and legs, covered with rather abundant, erect, coarse, yellowish hairs; those on the scapes and tibiae standing off at an angle of about 30° to 45°.

Yellowish-brown to piceous or castaneous-brown; appendages paler; first gastric segment in pale specimens often darker behind; mandibular teeth black.

Female.—Length, 10·5-12 mm.; wings, 13-14 mm.

Head rather small, scarcely longer than broad, subrectangular, very slightly broader behind than in front. Antennal scapes reaching about one-fourth their length beyond the posterior border of the head. Thorax large; mesonotum overarching the small pronotum in front, flattened behind; seen from above, distinctly longer than broad; scutellum longitudinally impressed in the middle; base of epinotum sloping, longer than the declivity, the spines long, blunt, directed upward, outward, and backward. Petiolar node compressed anteroposteriorly, its upper border feebly impressed in the middle; postpetiole short, broader than long. Gaster large. Wings with large discal cell and only one cubital cell.

Sculpture resembling that of the worker, but the whole upper-surface of head and cheeks longitudinally rugose, except a small median occipital area which is shining and coarsely punctate, and the clypeus, which is transversely rugulose on the sides. Thorax, including the mesopleurae, smooth and shining; epinotum sharply rugose, the rugae on the base transverse in front, arcuate behind, on the sides irregular above, longitudinal below and extending forward on to the mesosterna.

Pilosity like that of the worker.

Colour darker, castaneous; legs, usually including the coxae, yellowish; wings distinctly and uniformly infuscated throughout, radial vein and apterostigma dark-brown, remaining veins paler.

Male.—Length, 5-6 mm.; wings, 6-6·5 mm.

Head, excluding the eyes, distinctly longer than broad, convex behind and above, not broader behind than in front, its occipital border with a pronounced, strongly-reflected margin. Cheeks very short; eyes large and convex.

Mandibles narrow, with two or three teeth. Clypeus convex, with rounded entire anterior border. Antennal scapes slender, somewhat shorter than the head; funiculi with joints gradually increasing in length distally, but without distinct club; first joint slightly swollen. Thorax large; mesonotum, seen from above, as long as broad, very convex, especially in front, where it strongly overarches the very small pronotum. Mesosterna and mesopleurae large and very convex. Epinotum narrow, prolonged backward, its base rapidly sloping and more concave anteriorly, its posterior portion somewhat higher, subnodiform, and with very short declivity. Petiolar and postpetiolar nodes low and rounded, the latter longer than broad and somewhat broader than the former. Legs long and very slender. Venation of wings as in the female.

Pilosity and sculpture much as in the worker, but the hairs somewhat finer and the head much less rugose in front, the mesopleurae and upper-surface of the epinotum smooth and shining and the mandibles shining and sparsely punctate.

Colour as in the female, but the head darker, the mandibles yellow, and the wings and apterostigma somewhat paler.

Hab.—Victoria: Melbourne (type locality); Yarra district (W. W. Froggatt); Swan River (locality of female, *Atta antipodum*, cited by F. Smith). New South Wales: Jenolan Caves (J. C. Wiburd); Port Hacking (W. B. Gurney); National Park, near Sydney, Sutherland, Leura, Katoomba, Hornsby, Manly, Sandringham, Bulli Pass, Gosford, and Uralla (Wheeler); Fitzroy Falls (R. J. Tillyard); Sydney (A. M. Lea); Sydney and Katoomba (F. Silvestri); Shoalhaven district (W. W. Froggatt); Dorrigo (W. Heron). Queensland: Mount Tambourine and Colosseum (E. Mjöberg); Townsville (F. P. Dodd); Brisbane and Koah (Wheeler); Bribie Island (Wheeler and H. Hacker).

Although series of specimens from different localities vary more or less in average size, in colour, sculpture, and the length and shape of the epinotal spines, it seems inadvisable on the basis of the material examined to confer names on the varieties of this species.

Aphaenogaster (Nystalomyrma) pythia, Forel.

Pl. xxi., figs. 4-6; pl. xxii., figs. 5-8.

Aphaenogaster longiceps, Mayr.: Journ. Mus. Godeff., 12, 1876, p. 43, female, male (in part).

Aphaenogaster (Deromyrma) longiceps, Forel: Ark. Zool., 9, 1915, p. 76, two females and male.

Aphaenogaster (Deromyrma) pythia, Forel: *ibid.*, p. 76, two females and male.

Worker.—Length, 4-5·5 mm.

Averaging smaller than *longiceps*. Head scarcely longer than broad, distinctly broader behind than in front, with less-rounded posterior corners than in *longiceps*, and with less-constricted, though distinctly marginate, posterior border. Eyes distinctly less convex, antennae shorter, though the scapes surpass the occipital border of the head by nearly one-fourth their length; funicular joints shorter. Pronotum and base of epinotum more convex and rounded above in profile; mesoëpinotal constriction shorter. Epinotal spines shorter, much further apart at their base than long, and directed more upward. Petiolar node rising less abruptly from the peduncle. Legs shorter and stouter, gaster perhaps a little larger than in *longiceps*.

Smoother and more shining; mandibles subopaque and shining; the rugae between the frontal carinae and eyes feebler; epinotum smooth and shining above; sides of mesonotum and epinotum much more finely rugulose-punctate, so that their surfaces are also more shining.

Hairs finer and paler and a little more oblique on the legs and antennal scapes.

Colour usually paler and more yellowish than in *longiceps*.

Female.—Length, 9·5-11 mm.; wings, 12·5-13 mm.

Smaller than the female of *longiceps*, with the posterior corners of the head more pronounced and less rounded, the eyes somewhat less convex, the antennae, thorax, and legs shorter, and the epinotal spines smaller and acute. Venation as in *longiceps*.

Sculpture much as in *longiceps*, but the head more subopaque and more finely rugose. Gaster and upper-surface of thorax very smooth and shining.

Pilosity as in the worker.

Colour distinctly paler than that of the female *longiceps*, wings less deeply infuscated, yellowish-hyaline, with the radial vein and apterostigma dark-brown. Mesonotum with three large longitudinal brown blotches, gaster behind the first segment brownish-yellow, as are also the legs, including the coxae.

Male.—Length, 4-4·5 mm.

Smaller than the male of *longiceps*, the head and antennae shorter, the former scarcely longer than broad, excluding the eyes; thorax much shorter and broader, the

pronotum and scutellum seen together from above scarcely longer than broad. In profile the scutellum is more convex and projecting, the anterior portion of the base of the epinotum descends more abruptly, and the nodiform posterior enlargement is more pronounced in profile, but less pronounced when seen from above. The nodes of the petiole and postpetiole are much lower than in *longiceps*.

Sculpture, colour, and pilosity much as in that species.

Hab.—Queensland: Herberton (type locality) and Cedar Creek (E. Mjöberg); Gayndah; Peak Downs; Rockhampton; Kuranda and Enoggera (Wheeler). New South Wales: Dorrigo (W. Heron).

Aphaenogaster (Nystalomyrma) barbigula, sp. nov.

Pl. xxi., figs. 7 to 9; pl. xxii., fig. 9.

Stenamma (Ischnomyrmex) longiceps, Forel: Rev. Suisse Zool., 10, 1902, p. 439. female; Fauna S.W. Aust., Hamb. Exped., 1, 1907, p. 284, two females and male.

Aphaenogaster (Deromyrma) longiceps, Forel: Bull. Soc. Vaud. Sc. Nat., 49, 1913, p. 187, female.

Worker.—Length, 4·5-5·5 mm.

Head regularly-elliptical, about one and one-fifth times as long as broad, not broader behind than in front, with convex sides, rounded behind the eyes, and without posterior corners. Occipital border feebly reflexed. Eyes moderately convex. Mandibles irregularly denticulate, with three larger apical teeth. Clypeus, frontal carinae, and frontal area much as in *longiceps;* frontal groove indistinct. Antennae rather long, scapes incrassated distally, extending less than one-fourth their length beyond the posterior border of the head, funiculi distinctly 4-jointed, all the joints shorter than in *longiceps*. Pronotum and base of epinotum rounded and convex in profile; mesoëpinotal constriction long and pronounced, epinotal spines reduced to small, rather acute, suberect teeth. Petiolar node rounded, lower than in *longiceps* or *pythia*. Postpetiole scarcely longer than broad, decidedly broader than the petiole, in profile with abrupt posterior slope. Legs rather slender; posterior tibiae with small spurs.

Shining; mandibles subopaque, longitudinally striate; clypeus feebly and transversely rugulose; head very smooth and shining above and behind, sharply, longitudinally rugose between the frontal carinae and eyes; cheeks only with several small, scattered, piligerous punctures. Thorax smooth and shining, with the sides of the mesonotum and epinotum punctate-rugose, the rugae being somewhat longitudinal on

the former; remainder of body smooth and shining, with small, scattered piligerous punctures.

Hairs as in *longiceps* and *pythia*, except that they are very long on the gula, forming a well-developed psammophore; on the scapes and legs they are more oblique than in *longiceps* and more as in *pythia*.

Colour variable and like that of *longiceps*.

Female.—Length, 13 mm.; wings, 13·5 mm.

Similar to the females of the two preceding species. Head subrectangular, a little broader behind than in front, with rounded posterior corners. Antennal scapes extending only a short distance beyond the posterior border of the head. Thorax rather long; base of epinotum long, its spines acute, shorter than in *longiceps* and directed downward and backward. Scutellum and petiolar node without median impression. Venation of the wings as in the preceding species.

Smooth and shining; mandibles subopaque, finely striate; clypeus transversely rugulose; head finely, longitudinally rugose; rugosity on the base of the epinotum above fine, indistinct and transverse, more distinct and longitudinal on the sides.

Hairs similar to those of the worker but rather short, except on the gula, where they form a psammophore, as in the worker.

Colour uniformly yellowish-ferruginous, with slightly paler legs. Wings yellowish-hyaline, as pale as in *pythia*, with dark-brown radial vein and apterostigma; remaining veins resin-coloured.

Hab.—South Australia: Adelaide (type locality) (A. M. Lea and Rothney); Meningie (L. H. Mincham); Gawler (A. M. Lea); Karoonda to Peebinga (G. E. H. Wright). Western Australia: Dongarra; Gooseberry Hill; Wallaby Island: Beverley (F. H. Duboulay). Victoria: Sea Lake (J. C. Goudie). New South Wales: Yanco (W. W. Froggatt).

This species, described from numerous workers from many of the localities cited above and a single female taken by Mr. G. E. H. Wright between Karoonda and Peebinga, is readily distinguished from *longiceps* and *pythia* by the conspicuous psammophore of the worker and female, by the peculiar shape of the head and very short epinotal spines of the worker, and by the downwardly-directed epinotal spines of the female. The male seems to have been seen by Forel, but was not described, as it was referred to *longiceps*. When again taken it will probably be found to differ as much from the males of *longiceps* and *pythia* as the worker and female differ from the corresponding phases of these species.

DESCRIPTION OF PLATES.

Plate XXI.

Fig. 1. *Aphaenogaster (Nystalomyrma) longiceps*, F. Smith. Head of worker, dorsal view.
,, 2. Worker, body in profile.
,, 3. Head of female, dorsal view.
,, 4. *Aphaenogaster (Nystalomyrma) pythia*, Forel. Head of worker, dorsal view.
,, 5. Worker, body in profile.
,, 6. Head of female, dorsal view.
,, 7. *Aphaenogaster (Nystalomyrma) barbigula*, n. sp. Head of worker, dorsal view.
,, 8. Worker, body in profile.
,, 9. Head of female, dorsal view.

Plate XXII.

Fig. 1. *Aphaenogaster (Nystalomyrma) longiceps*, F. Smith. Thorax, petiole, and postpetiole of female in profile.
,, 2. Same of male.
,, 3. Thorax of male, dorsal view.
,, 4. Head of male, dorsal view.
,, 5. *Aphaenogaster (Nystalomyrma) pythia*, Forel. Thorax, petiole, and postpetiole of female in profile.
,, 6. Same of male.
,, 7. Thorax of male, dorsal view.
,, 8. Head of male, dorsal view.
,, 9. *Aphaenogaster (Nystalomyrma) barbigula*, n. sp. Thorax, petiole, and postpetiole of female in profile.

Acarians from Australian and Tasmanian Ants and Ant-nests.

By Nathan Banks.
(Communicated by Arthur M. Lea.)

[Read July 13, 1916.]

Plates XXIII. to XXX.

The myrmecophilous mites collected by Mr. Lea in Tasmania and Australia were sent me for determination and description several years ago.

Some of the specimens are immature and cannot now be determined; most of the adult specimens prove to be new species. This is not strange, as very few mites of these families have been described from these regions, and these few not from ant-nests.

There is little generically remarkable in the collection; they are such as might be found in ant-nests in other countries. Only a few of them were attached to the ants; the others are largely scavengers, but nevertheless will doubtless be found to be rather closely confined to ant-nests, and not generally distributed or with other environments. The myrmecophilous mites of few regions outside of Europe are known, and Mr. Lea deserves much praise for his industry and attention in gathering such a number of these tiny and generally-neglected creatures. As to host-relation, *Ectatomma metallicum* is host to seven species of mites; *Ponera lutea* and *Polyrachis hexacantha* each have six species; one mite occurs with four species of ants, but nearly all the others have but one host.

BDELLIDAE.

Bdella (Scirus) hospita, n. sp.

Pl. xxiii., fig. 4.

Body about twice as long as broad, broadly rounded behind, tapering in front; beak about two-thirds as long as width of body, with four hairs each side. Palpus with first and last joint about equal in length, and each about as long as the beak, second and third joints very short, subequal, last joint with long hairs on tips and apical half or more, few hairs on other joints. Cephalothorax with one eye each side. Dorsum of abdomen with few fine, scarcely-visible hairs. Legs of moderate length, femur 4 hardly as long

as the beak, with few fine hairs, more numerous on tarsi, especially near apex. Length, 1·6 mm.

Hab.—Victoria: Lal Lal, with *Polyrachis hexacantha*. Tasmania: Chudleigh, with *Iridomyrmex*.

ERYTHRAEIDAE.

Fessonia prominens, n. sp.

Pl. xxiii., fig. 5.

Body twice as long as broad, broadest in front; cephalothorax with a prominent, median process, and each side with two concavities; opposite the second one are the large, sessile eyes, two each side, close together, and behind them on the median line is a pair of pits or sensillae, each with a hair, but I cannot see a crista or groove. Legs slender, of even thickness throughout; legs 1 and 4 about as long as body, the tarsi a little shorter than the preceding joint, but not swollen. Body clothed above and below with short, cone-like hairs, each with small spicules in transverse rows; there are several patches on the dorsum free of hairs, three such spaces on the cephalothorax, and a row of four each side on the abdomen. The legs have similar but more elongate hairs, while the tarsi have still more slender hairs, almost bristly. Length, 1 mm.

Hab.—Victoria: Ocean Grove, with *Iridomyrmex nitidus* (Lea collection).

Rhyncholophus attolus, n. sp.

Pl. xxiii., fig. 6.

Similar in most respects to *R. retentus*, body of same shape; small, triangular cephalothorax is lower than abdomen, crista enlarged at posterior end, one eye each side, palpi rather long. The body is clothed with short hairy bristles, not clavate as in *R. retentus;* the legs are a little longer, leg 1 longer than body, 4 much longer than body, 2 and 3 about as long as body. In leg 1 the tarsus is as long as penultimate joint, and this latter scarcely any longer than the one before it (in *R. retentus* it is much longer). In hind legs the joints are all more slender than in *R. retentus*, the tarsus being scarcely three-fourths as long as the preceding joint, not at all enlarged toward tip, and plainly longer than tarsus 1. Length, 1·2 mm.

Hab.—New South Wales: Sydney, with *Ponera lutea*.

Rhyncholophus retentus, n. sp.

Pl. xxiii., figs. 2 and 3.

Body about one and one-half times as long as broad, sides nearly parallel, only little narrower behind. Dorsum

clothed with hairs, which are thick or slightly clavate, and all clothed with fine hairs. Cephalothorax small, triangular, much longer than abdomen; crista reaching near end, enlarged only at posterior end; one eye each side. Beak slender, terminating in a recurved point each side; palpi long and rather slender, ending in a blunt claw, with about seven teeth in a row before it, thumb of moderate length, not swollen, with hairs of moderate length. Legs not very slender; leg 1 rather longer than body, 4 about as long as body, 2 much shorter; tarsus 1 as long as penultimate joint, slightly swollen; tarsus 4 nearly three-fourths as long as penultimate joint; tarsus 1 with dense fine hairs, other joints with scattered short bristles, which are minutely hairy. Length, 1·3 to 1·5 mm.

Hab.—Victoria: Lal Lal, with *Polyrachis hexacantha*; Sea Lake and Ocean Grove, with *Iridomyrmex nitidus*.

TROMBIDIIDAE.

Trombidium aequalis, n. sp.

Pl. xxiii., fig. 1.

Body about one and one-fourth times as long as broad, broadest in front, broadly rounded behind. Legs short; leg 1 longest, about equal to body, leg 4 a little shorter, legs 2 and 3 subequal and about as long as width of the body, tarsus enlarged, but over three times as long as broad and fully one-third longer than the preceding joint, tarsus 4 not enlarged, equal to preceding joint. Palpi large and stout, ending in a rather slender claw, and a cylindric thumb equal to the claw, inner edge of claw fringed with teeth, the last of which is heavier than the others. Cephalothorax with two sessile eyes each side, close together, crista ending in a pair of sensillae. Legs clothed with moderately long single hairs. Body densely clothed with short erect hairs, those on cephalothorax and tip of body often branched. Length, 1 mm.

Hab.—New South Wales: Sydney, with *Ponera lutea* (Lea collection).

PARASITIDAE.

Celaenopsis breviatus, n. sp.

Pl. xxiii., fig. 7.

Yellowish-brown. Body about one and one-half times as long as broad, broadest in middle. Dorsum with scattered fine hairs; mouth-parts barely projecting in front of the body; palpi short; legs very short, the fourth pair longest, and these scarcely as long as width of body; leg 1 shorter and weaker than the other pairs, ending in a few short simple hairs, other legs with few short hairs. Sternal shield in

three parts, a transverse part in front, and behind are two pieces meeting angularly in the middle; the vulva, behind these pieces, is V-shaped; the genital plate has two bristles each side, the sternal plate one on each side, the ventral plates have many short bristles near sides, and others on the ventral area toward margin; the anus is hardly its length before the hind margin. Length, ·8 mm.

Hab.—Tasmania: Chudleigh, Hobart, and Kindred, with *Iridomyrmex*.

MYRMONYSSUS AEQUALIS, n. sp.

Pls. xxiv., fig. 10; xxv., figs. 14 and 16; and xxvi., fig. 21.

Body oval, rather pointed in front, broadly rounded behind, with short fine hairs around margin, and on dorsum densely covered with very short fine hair. All legs rather stout, and front pair hardly as long as body, second pair plainly shorter; third and fourth hardly as stout as others; the tibia and patella in each leg subequal in length, the tarsus always longer, and ending in a large caroncle, tarsus 2 on lower side narrowed before middle; all legs with few short, simple hairs, few as long as the width of a joint. The underside of the beak has several transverse or oblique rugose streaks on each side. Length, ·8 mm.

Hab.—Tasmania: Devonport, Hobart, and Ulverstone, on ants (14132) and (14941), and Bagdad, on thorax of *Iridomyrmex gracilis*.

HYPOASPIS MINUSCULUS, n. sp.

Pl. xxiv., fig. 8.

Body about one and one-half times as long as broad, broadest in front of middle, tapering each way. Dorsum with a few scattered, rather short, simple bristles, mostly near the margin. Palpi short. Legs rather slender, first pair nearly as long as body, second much shorter and stouter, fourth shorter than the first; in all the tarsi are much longer than the preceding joint, and all legs with fairly numerous hairs. Sternal plate short, concave behind, with three short bristles each side; ventral surface with a few bristles, and a pair of rather longer ones near tip; anal shield plainly longer than broad, broader in front than behind, with an apical bristle, anus near the front edge. Length, ·55 mm.

Hab.—New South Wales: Sydney, with ants (No. 20).

HYPOASPIS INEPILIS, n. sp.

Pl. xxv., fig. 17.

♀. Body about one and one-half times longer than broad, broadest at posterior third, tapering rather suddenly

behind, dorsal shield occupying anterior two-thirds of dorsum, truncate behind, with two rows of long bristles each side, the submedian row not regular, a few other bristles near margin, a pair in front, and several behind the shield. Legs long but rather stout, the second pair plainly heavier than the others, the first and fourth pairs about as long as the body, all with long simple hairs; tarsus 1 about one and one-half times longer than the preceding joint, all with short-stalked caroncles; sternal shield with three bristles each side, ventral shield very broad behind and truncate, anal shield but little longer than broad at base, not much narrowed behind, a stout bristle at each posterior corner, several bristles near margins of ventral shield, and others on ventral surface outside of shield. The peritreme begins behind coxa 3 and extends in slight, almost even, curve forward. Last joint of palpus has a little process or finger on middle beneath. Length, 1 mm.

Hab.—New South Wales: Sydney, with *Camponotus*, sp. (No. 14865).

Cyrtolaelaps gracilipes, n. sp.

Pl. xxiv., fig. 12.

♀. Body about one and one-half times as long as broad, broadest at middle, tapering each way, with about seven simple hairs on each side, mostly behind; legs very long and slender, especially the tarsi, all with simple hairs; sternal shield deeply concave behind, with two bristles each side, genital with one bristle each side, ventral shield tapering behind, the anal shield broad and truncate in front, a bristle behind anus, about six simple bristles on ventral surface each side of ventral shield.

The male has the body more tapering behind, leg 2 larger but without spurs, the coxa 4 more approximate. Length, ·9 mm.

Hab.—New South Wales: Sydney and Liverpool. Victoria: Lal Lal, with *Ponera lutea*, *Camponotus nigriceps*, *Ectatomma metallicum*, and *Polyrachis hexacantha*.

Cyrtolaelaps femoralis, n. sp.

Pl. xxv., fig. 15.

Yellow-brown; body oval, pointed in front, rounded behind; dorsum smooth, without hairs; epistoma with a slender median point; sternum with four bristles in a transverse row across middle; vulva between hind coxae subtriangular; legs short, but very slender and with only fine hairs, tarsus 1 ends in fine hairs but with a small caroncle and claws, tibia 1 shorter than tarsus, as long as patella; in legs 3 and 4 the femora are long, very slender at base, and

curved, the patella and tibia both very short, subequal, the tarsus very long. Length, ·75 mm.

Hab.—Tasmania: Evandale Junction, with *Ectatomma metallicum*.

PARASITUS LYRATUS, n. sp.

Pl. xxv., fig. 13.

Yellowish. Body hardly twice as long as broad, sides evenly rounded, broadest behind middle; no hairs on the body above, a pair of very short ones at tip; sternal plate lyre-shaped, with three pairs of bristles, metapodia nearly circular, each with a bristle, ventral shield roundedly triangular, the point in front between the hind coxae; anal shield nearly its length behind ventral, subtriangular, with an apical bristle; legs rather long, front pair very slender, with some apical hairs as well as the claws; all legs with few short almost spine-like hairs. In male the second and fourth pairs of legs are plainly thicker than the others, the femur of leg 2 with a stout spine in front; coxae 4 approximate, not one-half their diameter apart; ventral and anal shields united and nearly covering the venter, pointed behind. Length, 1 mm.

Hab.—Tasmania: Dunorlan, with *Amblyopone australis*.

PARASITUS DISPARATUS, n. sp.

Pl. xxiv., fig. 11.

Body nearly twice as long as broad, tapering each way; above with many short stout bristles, mostly clavate, especially at sides, one at each humerus is longer and serrate behind: legs slender, all with bristles, but near tips with fine hair; first pair about as long as the body, the tarsus nearly as long as the tibia and patella together; leg 2 stouter but without spurs, leg 4 reaching behind body, the tarsus 4 not longer than tarsus 1, sternum rather narrow, between hind coxae no wider than a coxa; the anal shield large and broad, the anus its length from the tip. Length, ·8 mm.

Hab.—Tasmania: Latrobe, with *Polyrachis hexacantha*.

PARASITUS INVERSUS, n. sp.

Pl. xxiv., fig. 9.

Body pyriform, about one and one-half times longer than broad, broadly rounded behind. Dorsum with a pair of minute bristles on extreme front; a submarginal row of about eight long bristles, those behind stouter than those in front, and a submedian pair toward tip; margin with shorter bristles, except toward front. Venter with short bristles each side behind, a pair below on beak, three pairs on the sternal plate, a pair (with minute hair at base) just behind the sternal

plate, a pair toward base on sides of ventral plate, one each side of the anus, and a long one behind on anal plate. Legs long and rather slender, with scattered fine hairs. The peritreme is outwardly margined by a plate which extends a little behind hind coxae. Ventral plate much broader behind than in front, a little longer than broad, anal plate much broader in front, long-pointed behind; the anus (broader behind) at about middle of anal plate; an elongate metapodial plate each side behind the peritremal plate. Length, 1·1 mm.

Hab.—Victoria: Portland (H. W. Davey), with *Ectatomma metallicum*.

ANTENNOPHORIDAE.

Ptocharus daveyii, Silvestri.

Pl. xxvi., fig. 22.

Boll. Labr. Zool. Agric. Portici, v., p. 56, 1910.

Body as broad as long or much broader, and very high behind according to amount of distension, broadest at or behind middle. Dorsum shows a shield much longer than broad, and beyond its middle a transverse line, not reaching either side; dorsum without hair. Venter and margin with many fine short hairs; genital plate triangular, separated by a line from the ventri-anal plate, latter broader than long, broadest on anterior third, anal aperture at its tip. Legs very short and stout; first pair nearly as long as body, clothed with many simple hairs, longer ones at tip of tarsus, other tarsi rather blunt. Length, 1 mm.

Hab.—New South Wales: Liverpool, with *Camponotus aeneopilosus* and *Iridomyrmex nitidus*.

Paramegistus australis, n. sp.

Pl. xxvi., fig. 19.

Body plainly a little longer than broad. Dorsum smooth, few if any bristles. Mouth-parts small; movable finger of male mandibles slender, curved. Legs short, not as long as width of body; leg 1 slender, with many rather stout bristles, other legs thicker, with very few bristles. Sternal shield transversely divided, the smaller anterior part apparently in three parts; two short spines each side on the anterior part and one each side on the posterior part; male aperture elliptical, small. Ventral plate large, very broad at posterior third, with about 16 short spines; anal plate broader than ventral, crescentic, with many fine hairs, the anus, which is pointed behind, near its anterior margin. Length, ·8 mm.

Hab.—Victoria: Lal Lal, with *Polyrachis hexacantha*.

Probably will form a new genus on account of shape of ventral plate.

ANTENNOPHORUS EMARGINATUS, n. sp.

Pl. xxvi., fig. 20.

Body much broader than long, rather pointed in front, behind plainly emarginate in the middle; venter with a large cavity containing the legs and margined by an outer ridge fringed with inward-projecting bristles. Margin with bristles, few on sides, many behind. Legs short and stout, no spines, leg 1 more slender, tarsus ending in a tuft of hairs, and several hairs at tip of penultimate joint. Anal opening at hind margin of anal plate, close to hind border of body. Dorsum with many stiff bristles, rather longer than those on venter. Length, ·6 mm.

Hab.—New South Wales: Sydney, with *Ponera lutea*.

UROPODIDAE.

TRACHYUROPODA LEAI, n. sp.

Pl. xxvi., fig. 18.

Dark yellowish-brown. Body subpyriform, about one and one-half times as long as broad, narrowed in front, evenly rounded behind, lateral margins rather roughened, the hood over mouth-parts crenulate in front; dorsal surface of body somewhat roughened, but not coarsely so, legs short and stout, coxa 1 with several small spines at tip, femur 1 with a very large tooth on inner edge toward base in both sexes; tarsus with a short spine above near middle and with many fine long hairs toward tip. Male genital aperture is between coxae 3, circular; anal aperture slightly elongate, near tip of body, and with an emarginated ridge just behind it; female aperture subtriangular, about one and one-half times as long as broad at base, tip rounded. Length, 1 mm.

Hab.—New South Wales: Sydney and Otford, with *Stenamma longiceps*.

TRACHYUROPODA CONSTRICTA, n. sp.

Pl. xxvi., fig. 23.

Body about one and one-third times longer than broad, broadest at middle, just behind the middle it is plainly constricted on each side, the outer margin uneven; a prominent process in front of humeri, the humeri also prominent, the sides undulate, the posterior margin only faintly irregular: within this outer margin is an inner line, wholly even, and pointed in front. Dorsal surface minutely rough, but no ridges nor prominent cavities, only some granules and minute pits. Male aperture broader in front than behind, and with a rather large hyaline spot between it and coxa 3; female

vulva occupying most of sternal area, long and not much widened behind, behind it are two transverse rows of short dark ridges; inner posterior margin of venter with a curved ridge extending up each side: anus with a small hyaline spot each side. Legs with few very minute hairs, except near tip. Colour yellowish-brown. Length, ·9 mm.

Hab.—New South Wales: Sydney, with *Ponera lutea*.

Uroplitella comparata, n. sp.

Pl. xxvii., figs. 24 and 29.

Yellowish-brown. Body nearly one and one-half times as long as broad, broadest at middle, tapering behind almost to a point, in front truncate below, above with small rounded portion; a row of hairs all around body a little way from margin. Legs very short; tarsus 1 with many fine hairs toward tip, other tarsi with spines. In front of coxae 1 is a broad semicircular plate, and beneath it two ridges, at first approaching each other, then running parallel, but not meeting. The female genital aperture is in middle of body, about one-fourth longer than broad, almost reaching the coxae 1, the anterior two-thirds of border is thickened; anal aperture more than twice its length in front of submarginal line, two bristles behind it, two bristles each side behind genital aperture, one behind coxa 4, a transverse curved row of 8 bristles half-way from hind coxae to anus, two bristles in front and five each side of genital aperture, and two each side behind on perigenital plate. Length, ·6 mm.

Hab.—Tasmania: Evandale Junction, with *Myrmecia* (No. 6423).

Uroplitella disparata, n. sp.

Pl. xxvii., figs. 26 and 27.

Yellow-brown. Body about one and one-half times as long as broad; in front is a very small inconspicuous median swelling, evenly rounded behind; no hairs around margin; in front of coxae 1 is a triangular space bordered by a dark ridge. Legs short, femur 1 with a tubercle near inner base bearing a bristle; tarsus 1 with fine hairs near tip, other tarsi with rather stout spines; anus about one and one-half times its length from submarginal line; female genital aperture in middle of body, about one and one-third times as long as broad, margin on anterior two-thirds thickened; four bristles in front, four each side, and fine hairs behind on venter, three hairs (one median) behind anus; perigenital plate elongate and rounded behind. Male aperture circular, between coxae 2 and 3, and one and one-half times its diameter from them. Length, ·65 mm.

Hab.—Tasmania: Railton, Burnie, and Hobart, on *Myrmecia pyriformis*. New South Wales: Sydney, with *Camponotus nigriceps*; and Otford, with *Camponotus aeneopilosus*.

Uropoda amblyoponae, n. sp.

Pls. xxvii., fig. 25, and xxx., fig. 46.

Yellow-brown. Body about one and one-third times longer than broad, a very faint swelling in middle of front margin; dorsum with simple hairs and a submarginal row of about 16 scale-like ones along posterior submarginal groove. Submarginal line extends up to front legs, and is farther from margin than length of anus. Legs short, tarsi slender, tarsus 1 with many long simple hairs toward tip, other tarsi with spines about as long as basal width of joint; in front of coxae 1 are two large approximate plates (labial plates) hiding the front tarsi. Male genital aperture between coxae 3 circular, not its diameter from coxae 3, a corneous part appearing in each posterior side of opening. Female aperture nearly one and one-half times as long as broad, slightly narrowed behind, the anterior three-fifths much heavier along the margin than the posterior two-fifths; hind margin at middle of hind coxae; anterior margin more than width of coxa behind the camerostome. Venter with few short hairs. Length, ·7 mm.

Hab.—Tasmania: Dunorlan and Hobart, with *Amblyopone australis*.

Uropoda apicata, n. sp.

Pl. xxx., figs. 47 and 48.

Very similar to *U. fraterna*, but the internal line in the plate in front of coxae 1 is angulate and pointed in front, and in the male the genital aperture is between coxae 2 and 3, and there is a hyaline spot each side between the bases of these coxae. Body about one and one-third times as long as broad, broadly rounded at each end; no hairs above; in the male the middle of anterior margin is rather incurved; female genital aperture hardly nearer posterior than anterior margin; about one and one-fourth times as long as broad, truncate behind, and reaching middle of hind coxae; anus near submarginal line; an internal line fully length of anus in front of it; legs very short, tarsi shorter than usual, with short spines, tarsi 1 with hairs near tip. In the male the plate in front of coxae 1 is broader in front; hind coxae more approximate than in female: male genital aperture more than the diameter from camerostome. Length, ·45 mm.

Hab.—New South Wales: Sydney, with *Iridomyrmex rufoniger* and *Ponera lutea*.

Uropoda bifrons, n. sp.

Pl. xxvii., fig. 30.

Body nearly circular, a little longer than broad, a slight protruberance in front; legs very short, with few hairs, except on tarsi, toward tip; femur 1 with a truncated cone tipped with a hair on inner side near base (at base of the lamella), femur 2 with a stout spine at base, hind tarsi with two small teeth on inner side at and beyond middle. Labial plate forming two large divergent plates, each pointed in front; two small hairs in front of the plate. Male genital aperture between coxae 3, plainly a little nearer the posterior than to the anterior edge of the body. Anal aperture small, more than its length in front of its margin. Ventral surface with few scattered simple hairs; the peritreme makes a strong foot-shaped bend outward from coxa 2. The dorsum has submedian rows of slightly clavate hairs, and a few others toward the tip. Length, 1·2 mm.

Hab.—Tasmania: Huon River and Launceston, with *Myrmecia pyriformis*.

Readily known by the shape of the labial plate.

Uropoda bilobata, n. sp.

Pl. xxviii., fig. 31.

Yellowish. Body about one and one-half times as long as broad, narrowed in front, almost pointed, broadly rounded behind; dorsum with scattered, long simple hairs; plate in front of coxae 1 bilobed, and with a pair of submedian bristles in front; female genital aperture nearer to hind than to front margin, about one and one-half times as long as broad, hardly narrowed behind, where it is truncate, but not reaching hind border of hind coxae; in front but little separated from camerostome; no hairs on venter; anus fully its length from the submarginal line; legs very short and rather slender, the tarsi with short spines, the front tarsi with hairs toward the tip. Length, ·6 mm.

Hab.—New South Wales: Otford, with *Stenamma longiceps*.

Uropoda convexifrons, n. sp.

Pls. xxviii., fig. 37, and xxix., fig. 41.

Pale yellow-brown. Body about one and one-third times as long as broad, broadest behind middle, somewhat prominent in front, broadly rounded behind; dorsum without hairs: coxa 1 with three hairs in transverse row: in front of coxae 1 is a broad semicircular plate with inrolled lateral edges hiding the anterior tarsi; legs short, tarsus 1 with fine hairs near tip, other tarsi with short stout spines. Female genital aperture a little nearer to hind than to front margin,

about one and one-fourth times as long as broad, broadest at middle, tapering behind, reaching to hind margin of hind coxae, in front of it four bristles, venter without bristles; anus nearly circular and about its length from the submarginal line. Male genital aperture hardly circular, broader in front between coxae 3, and nearly one and one-half times its diameter from them. Length, ·5 mm.

Hab.—Tasmania: Latrobe, with *Ectatomma metallicum*.

Uropoda dentifrons, n. sp.

Pl. xxviii., figs. 33, 34, and 36.

Body short, subpyriform, slightly pointed in front, body hardly one-fourth longer than broad, male genital aperture between coxae 3 only a trifle nearer to the posterior than to the anterior margin. Dorsum with scattered, rather long, simple hairs; a row of very short ones submarginal on the lower edge of the body. Labial plate broad, divided in middle, each lobe with several teeth on anterior margin. Legs very short, stout, with few hairs except at tip, femora 1 and 2 of male with a large spur near inner base; peritreme beyond coxa 2 with a long outward band. In the female the vulva is about one-half to two-thirds of coxae 2 behind the camerostome, its anterior edge at middle of coxae 2; a pair of submedian hairs in this space and one each side at coxae 2; vulva about one and one-half times as long as broad, broadly rounded in front; behind it is truncate between coxae 4. Length, ·55 mm.

Hab.—Tasmania: Stanley. Victoria: Portland, with *Ectatomma metallicum*.

Uropoda duplicata, n. sp.

Pl. xxix., fig. 38.

Yellowish-brown. Body about one and one-fourth times as long as broad, broadest in middle, rounded behind, in front with a small median prominence; dorsum with scattered fine hairs arising from hyaline dots; plate in front of coxae 1 with outer outline truncate in front and an inner rounded portion; female genital aperture one and one-fourth times as long as broad, rather nearer hind than front margin, barely narrowed behind, and reaching to hind margin of hind coxae, in front close to camerostome, four hairs each side and four in front; few, if any, distinct hairs on venter; anus more than its length from the submarginal line; legs rather slender, front tarsi with many hairs toward the tip, others with short spines. Length, ·55 mm.

Hab.—New South Wales: Sydney, with *Polyrachis ammon*.

UROPODA FRATERNA, n. sp.

Pl. xxx., fig. 49.

Very similar to *U. internata*. The plate in front of coxae 1 is more acute in front, and shows an inner curved ridge; the female genital aperture is nearer to the camerostome, and is about one and one-third times longer than broad, not noticeably narrowed behind coxae, and not reaching much behind middle of hind coxae. The venter shows an internal line, as in *U. internata*, but it is farther in front of the anus; there are hairs around genital aperture and on venter, as in *U. internata*, and some between the internal and submarginal lines. The male genital aperture is circular and situated between coxae 2, and hardly its diameter from the camerostome; the plate in front of the coxae 1 is more nearly truncate in front. Length, ·45 mm.

Hab.—Tasmania: Chudleigh, with *Polyrachis hexacantha*.

UROPODA INTERNATA, n. sp.

Pl. xxviii., fig. 35.

Yellowish-brown. Body about one and one-half times as long as broad, broadly rounded at each end, broadest near middle; no hairs on dorsum; plate in front of coxae 1 roundly triangular; female genital aperture nearer to posterior than to anterior end, fully one and one-half times as long as broad, broadly rounded in front, narrowed at hind coxae, almost truncate behind, where it reaches hind edge of hind coxae; in front quite widely separated from camerostome, two pairs of hairs in front, four each side, and one behind hind coxae, venter with some scattered fine hairs; anus almost reaching the submarginal line, in front of it a distinct internal line extending up each side to hind tarsi. Legs very short, especially femora, tarsi with stout spines, except tarsus 1 with fine hairs near tip. Length, ·4 mm.

Hab.—Tasmania: Devonport, with *Iridomyrmex*.

UROPODA LONGIFRONS, n. sp.

Pl. xxviii., fig. 32.

Very similar to *U. convexifrons* from Tasmania and with the same host; but the plate in front of coxae 1 is plainly longer, about as long as broad. The body is about one and one-third times as long as broad, broadest behind the middle, narrowed in front; no hairs on dorsum. The female genital aperture is much closer to the hind than to the front end, about one and one-third times as long as broad, slightly narrowed and truncate behind, where it reaches the hind edge of hind coxae, in front well separated from the camerostome, four bristles in front of it; anus hardly its length from the submarginal line; few, if any, hairs on venter; tarsi with short

spines, front tarsi with fine hairs toward tip. Length, ·55 mm.

Hab.—New South Wales: Sydney. Victoria: Sea Lake, with *Ectatomma metallicum*.

Uropoda obliquifrons, n. sp.

Pl. xxix., figs. 39 and 40.

Body only a little longer than broad and only slightly pointed in front. A submarginal row of simple hairs, and above an inner row of long scale-like hairs, and others on the middle area of the dorsum. The labial plate with its anterior edge retreating obliquely each side and slightly toothed, rather more in the male than in the female. Legs short, tarsi hairy at tip; femur 1 of male with a spur near base bearing a hair, femur 2 of male with a long spur near base, tarsus 4 of male with a tooth on inner edge near the middle. In female only short spurs on the anterior femora. The male genital aperture is between and fully its diameter from the coxae 3, and there are bristles in front of it and at bases of the coxae, and a few on the ventral plate. This male aperture is a little nearer the posterior than anterior edge of the body. In the female the genital aperture is about one-half the width of a coxa behind the camerostome, and its hind border is between coxae 4 and nearly truncate, the aperture is broadest near its middle; there are two pairs of bristles in front of it. The peritreme makes a prominent bend outside of coxae 2. Length, 1·05 mm.

Hab.—Tasmania: Burnie, with *Amblyopone australis*.

Uropoda submarginata, n. sp.

Pl. xxx., fig. 51.

Very similar to *U. apicata*, but the plate in front of coxae 1 is broader in front and the inner pointed part is more triangular; there is no internal line on the venter, and the dorsum has scattered hyaline dots, each with minute hair, and a submarginal line of these hyaline dots, slightly elevated, all around body above. Body about one and one-third times as long as broad, broadest in middle, broadly rounded at each end; female genital aperture about in middle of body, one and one-fourth times as long as broad, hardly narrowed and truncate behind, where it reaches to middle of hind coxae; anus about one and one-half times its length from submarginal line, a bristle each side and a little behind it, but few other bristles on venter; four bristles in front of genital opening and several each side. Male aperture circular, about its diameter from the camerostome and from coxae 2, situated between hind parts of coxae 2. Length, ·6 mm.

Hab.—New South Wales: Otford, with *Camponotus aeneopilosus*.

UROPODA TASMANICA, n. sp.

Pl. xxix., figs. 42 to 44.

Red-brown. Body about one and one-fourth times as long as broad, broadest a little beyond middle, in front is a hardly-distinct, rounded projection, showing slightly more prominent in some than other specimens. Dorsum with many scattered small clavate hairs, but not prominent. Venter with numerous short simple hairs, sternum with a pair just behind camerostome; submarginal line about twice the length of anus from the margin. Legs short, femora thickened, tarsi long, tarsus 1 with many long simple hairs near tip, other tarsi with some spines about as long as basal width of the joint. Genital aperture of female one and one-half times longer than broad, a little narrowed behind; in the male the genital opening is circular, situated between coxae 3, from which it is separated by hardly the diameter, and shows a dark spot each side. Length, 1 mm.

Hab.—Tasmania: Railton, Ulverstone, and Hobart, with *Myrmecia pyriformis*.

UROPODA TRILOBATA, n. sp.

Pl. xxvii., fig. 28.

This species is similar to *U. convexifrons*, but the plate in front of coxae 1 is more elongated and trilobed in front. The body is about once and one-third times as long as broad, broadest in middle, and broadly rounded both in front and behind; dorsum hairless. The female genital aperture is plainly nearer the hind than the front margin of body, it is about one and one-third times as long as broad, broadly rounded in front and hardly narrowed behind, and reaches to the hind margin of the hind coxae; in front it does not extend so near the camerostome as in *U. convexifrons*, and the four hairs in front are in pairs, one pair near the camerostome and one near the genital opening. The anus is hardly its length from the submarginal line. The tarsi have stout spines, except tarsus 1, which has fine hairs near tip. Length, ·5 mm.

Hab.—Tasmania: Devonport, with ant (No. 14941).

ORIBATIDAE.

GALUMNA ANTALATA, n. sp.

Pl. xxx., fig. 45.

In general similar to *G. alata*. A large, smooth body, small cephalothorax, large wings, nearly twice as long as deep, and emarginate before the middle. The cephalothorax

shows no trans-lamella, and there are no superior bristles; the pseudostigmatic organ is setaceous (not enlarged at tip). The legs show only slender simple bristles; the femora are not margined. The globose abdomen is without hairs; the genital aperture is nearly square and almost twice its length in front of the very much larger anal aperture: this is fully twice as long and nearly twice as wide as the genital aperture, and is widest in posterior part. The coxal plate shows three short lines each side, the posterior two united at inner ends. Length, ·6 mm.

Hab.—Tasmania: Latrobe, Burnie, and Hobart, with *Amblyopone australis* and *Ectatomma metallicum*.

NOTASPIS SPINULOSA, Michael.

Specimens of this large, bristly species were taken at Hobart, Tasmania, with the ant *Iridomyrmex*. It was described from New Zealand, and agrees well with Michael's description and fine figures.

TYROGLYPHIDAE.

TYROGLYPHUS INAEQUALIS, n. sp.

Pl. xxx., fig. 50.

Pale-yellowish, with dark spot each side on abdomen. Body fully twice as long as broad; abdomen in the female rather emarginate behind in middle, and here with three long hairs on each side, one of them about as long as the body, others as long as the width of the body. Cephalothorax with four large, subequal bristles above on the posterior part and two long ones in front. Legs rather short; leg 1 larger than the other pairs, and in male much enlarged, but not toothed. The hind tarsi very slender; all legs with few hairs or bristles, that at tip of penultimate joint the largest; in hind legs the intermediate joints subequal in length, and together nearly as long as the hind tarsus. Length, ·3 mm.

Hab.—New South Wales: Sydney, with *Stenamma longiceps* (Lea collection).

EXPLANATION OF PLATES.

PLATE XXIII.

Fig. 1. *Trombidium aequalis*, tarsus 1, palpus, hairs.
,, 2. *Rhyncholophus retentus*, palpus.
,, 3. ,, ,, leg 1, hairs, beak.
,, 4. *Bdella hospita*, palpus, beak.
,, 5. *Fessonia prominens*, hairs, cephalothorax.
,, 6. *Rhyncholophus attolus*, legs, palpus, hairs.
,, 7. *Celaenopsis breviatus*, venter.

PLATE XXIV.

Fig. 8. *Hypoaspis minusculus*, venter.
,, 9. *Parasitus inversus*, venter.
,, 10. *Myrmonyssus aequalis*, beak.
,, 11. *Parasitus disparatus*, venter.
,, 12. *Cyrtolaelaps gracilipes*, venter.

PLATE XXV.

Fig. 13. *Parasitus lyratus*, venter, claw, male leg 2.
,, 14. *Myrmonyssus aequalis*, dorsum.
,, 15. *Cyrtolaelaps femoralis*, part of venter.
,, 16. *Myrmonyssus aequalis*, male leg 1.
,, 17. *Hypoaspis inepilis*, dorsum.

PLATE XXVI.

Fig. 18. *Trachyuropoda leai*, venter, leg 1.
,, 19. *Paramegistus australis*, venter, mandible, epiandrium.
,, 20. *Antennophorus emarginatus*, venter.
,, 21. *Myrmonyssus aequalis*, leg 2, male.
,, 22. *Ptochares daveyii*, venter.
,, 23. *Trachyuropoda constricta*, venter, part of male venter, hind tarsus.

PLATE XXVII.

Fig. 24. *Uroplitella comparata*, sternum.
,, 25. *Uropoda amblyoponae*, labial plate, hairs.
,, 26 *Uroplitella disparata*, sternum.
,, 27 ,, ,, leg 1, labial plate.
,, 28. *Uropoda trilobata*, leg 1, labial plate.
,, 29. *Uroplitella comparata*, leg 1, labial plate.
,, 30. *Uropoda bifrons*, labial plate.

PLATE XXVIII.

Fig. 31. *Uropoda bilobata*, coxa 1, labial plate, hairs.
,, 32. ,, *longifrons*, leg 1, labial plate.
,, 33. ,, *dentifrons*, labial plate.
,, 34. ,, ,, peritreme, epiandrium.
,, 35. ,, *internata*, venter.
,, 36. ,, *dentifrons*, leg 1.
,, 37. ,, *convexifrons*, part of venter.

PLATE XXIX.

Fig. 38. *Uropoda duplicata*, part of venter, hairs.
,, 39. ,, *obliquifrons*, coxae 1 and 2, peritreme, hair.
,, 40. ,, ,, labial plate.
,, 41. ,, *convexifrons*, epiandrium.
,, 42. ,, *tasmanica*, venter, hairs.
,, 43. ,, ,, tarsi 4 and 1.
,, 44. ,, ,, epiandrium.

PLATE XXX.

Fig. 45. *Galumna antalata*, leg 1, pseudostigmal hair.
,, 46. *Uropoda amblyoponae*, venter.
,, 47. ,, *apicata*, part of venter, female.
,, 48. ,, ,, ,, ,, male.
,, 49. ,, *fraterna*, labial plate.
,, 50. *Tyroglyphus inaequalis*, legs 1 and 4.
,, 51. *Uropoda submarginata*, part of venter.

THE LEPIDOPTERA OF BROKEN HILL, NEW SOUTH WALES. PART II.

By OSWALD B. LOWER, F.Z.S., F.E.S., etc.

[Read July 13, 1916.]

BOMBYCINA.

Family LYMANTRIADAE.

224. EUPROCTIS CORALLIPHORA, Low.
Two specimens, in September.

225. EUPROCTIS EDWARDSI, Newm.
Two specimens, in March.

226. COLUSSA DENTICULATA, Newm.
Not uncommon during March and April.

227. COLUSSA VARIA, Wlk.
Two specimens; one from Stephens Creek, one from Yandama.

228. ANTHELA STYGIANA, Butl.
Two fine specimens, in March and April.

229. ANTHELA PYROMACULA, Low.
Two specimens, in September.

230. ANTHELA CALLISPILA, Low.
Three specimens, in April.

231. ANTHELA PSAMMOCHROA, Low.
Taken occasionally, in March and April.

232. ANTHELA CLEMENTSI, Swin.
Two specimens, in March.

233. ENTOMETA FERVENS, Wlk.
Rather common, December to March. Attached to *Eucalyptus*.

234. ORGYIA RETINOPEPLA, Low.
One specimen, in October.

Family HYPSIDAE.

235. Nyctemera amica, White.

Common during March and April.

Family SPHINGIDAE.

236. Herse convolvuli, Linn.

Not uncommon, February to April.

237. Herse abadonna, Fabr.

Five specimens, in March. This is *distincta*, Lucas.

238. Celerio lineata, Fabr.

Not uncommon, February and March.

This form is known as *livornicoides*, Lucas. The genus *Celerio* has priority over *Chaerocampa*, Dup.

239. Celerio scrofa, Bdv.

Several specimens, October to March.

240. Celerio erotus, Cram.

One (poor), specimen, in March, an accidental straggler.

241. Celerio euphorbiae, Linn.

One specimen, in April, captured by Mr. J. Fairhead.

242. Hippotion celerio, Linn.

Not uncommon, January to March.

243. Hemaris hylas, Linn.

Three specimens, early in January.

244. Hemaris kingi, Macl.

One specimen, at electric light, in February.

245. Hopliocnema brachycera, Low.

Taken occasionally, September to November.

I have specimens from Pinnaroo and Semaphore, South Australia; Roebourne, Western Australia; and Alice Springs, Central Australia.

This species has the facies of species of *Cosmotriche*, one of the *Notodontidae*.

Family EUPTEROTIDAE.

246. Ochrogaster contraria, Wlk.

Not uncommon during March and April.

247. Ochrogaster interrupta, Wlk.

Four specimens, in March. Probably a form of *contraria*.

248. Epicoma argentata, Wlk.

Three specimens, at light, in October.

Family NOTODONTIDAE.

249. Destolmia lineata, Wlk.

Five specimens, all males, in October and November, almost certainly attached to *Casuarina*. I have it from Belair and Pinnaroo, South Australia, taken in September.

250. Stauropus (?) euryscia, Low.

One specimen, type, in June.

Family BOMBYCIDAE.

251. Bombyx oxygramma, Low.

Two specimens, in May.

252. Bombyx mioleuca, Meyr.

One specimen, in March.

253. Bombyx albifinis, Wlk.

Two specimens (poor), from near Tarrawingee.

These three species cannot remain in the genus *Bombyx* and until the whole group is revised it would be useless to attempt their generic position.

Family PSYCHIDAE.

254. Hyalarcta huebneri, Westw.

Two specimens, in November.

255. Clania ignobilis, Wlk.

Five specimens, bred in February.

256. Clania lewinii, Westw.

One specimen, November.

257. Plutorectis grisea, Heyl.

One specimen, at light, March.

258. Plutorectis gymnophasa, Low.

Three specimens, October, November.

259. Paracharastis erionota, Low.

Three specimens, March to May.

Family COSSIDAE.

260. Cossus cinereus, Wlk.

Taken occasionally at light, in May and June. It is a ponderous insect, especially the female.

261. Zeuzera coscinopa, Low.

Several specimens, March and April.

262. Zeuzera neuroxantha, Low.

Five specimens, October and March.

Family HEPIALIDAE.

263. Hectomanes polyspila, Meyr.

Two abraded specimens, in March. Mr. R. S. Lower once met with this species in hundreds, attracted by light, at Pinnaroo, South Australia, in March.

264. Pielus hyalinatus, Herr-Sch:

Not uncommon, during May and June.

265. Trictena labyrinthica, Don.

Taken occasionally, in May and June.

PYRALIDINA.

This group is rather extensively represented in the district, the whole of the families being *en evidence*. As will be apparent by those enumerated, nearly all the world-wide species are found here. *Hellula undalis*, Gn.: *Nomophila noctuella*, Schiff; and *Tritaea affinitalis*, Led. (=*ustalis*, Wlk.), are met with in vast numbers, more especially *undalis*. The *Phycitidae* and *Crambidae* are more numerous than the other families, whilst the *Pterophoridae* are represented by the single *Doxosteres canalis*, Wlk.

Subfamily PHYCITIDAE.

266. Euzophera cosmiella, Meyr.

Rather common, at light, August to December.

267. Euzopherodes poliocrana, Low.

Taken occasionally, March and April.

268. Cateremna microdoxa, Meyr.
Not uncommon, September to November.

269. Eucarphia tritalis, Wlk.
Taken occasionally, September to December.

270. Eucarphia neotomella, Meyr.
One specimen, September.

271. Etiella behrii, Zeller.
Rather common, August to January.

272. Etiella chrysoporella, Meyr.
Taken occasionally, August to November.

273. Pempelia opimella, Meyr.
Two specimens, October.

274. Pempelia (?) hemichlaena, Meyr.
One fine specimen, October.

275. Heterographis ianthemis, Meyr.
Salebria placoxantha, Low., P.L.S., N.S.W., p. 45 (1898).
I think my specimens are identical with Mr. Meyrick's. Mr. Meyrick, however, gives no locality in his original description. T.E.S., Lond., p. 260 (1887).
Five specimens, March, September, and October.

276. Epicrocis gypsopa, Meyr.
Taken at rare intervals, March and April.

277. Epicrocis oculiferella, Meyr.
Rather common, September to November. Varies considerably in ground-colour and forewings, some specimens being almost clear ochreous, others silvery-grey to dark fuscous.

278. Lasioticha canilinea, Meyr.
Two specimens, March.

279. Cryptoblabes centroleuca, Low.
Not uncommon, at light, November and December.

280. Trissonca mesactella, Meyr.
Not uncommon, March and April. Somewhat variable in ground-colour of forewings, which is sometimes pale-ochreous, or fuscous-whitish.

281. Nephopteryx monospila, Low.
Taken occasionally, April.

282. Hypophana homosema, Meyr.
Tolerably common, at light, September to April.

283. Homoeosoma vagella, Zeller.
Common, at light, August to December.

284. Crocydopora cinigerella, Wlk.
Rather common, August to December.

285. Anerastia mirabilella, Meyr.
Not uncommon, February and March.

286. Anerastia distichella, Meyr.
Taken occasionally, March and April.

287. Anerastia metallactis, Meyr.
Five specimens, April.

288. Ephestia elutella, Hüb.
Rather common, July to December.

289. Ephestia interpunctella, Hüb.
Tolerably common, October to January.

Subfamily GALLERIADAE.

290. Achraea grisella, Fab.
Taken occasionally, November, March, and April.

291. Aphomia pachytera, Meyr.
Taken occasionally, January to March.

292. Melissoblaptes disema, Low.
One specimen, May.

293. Melissoblaptes baryptera, Low.
One perfect specimen, March. The type came from Parkside, South Australia.

294. Galleria mellonella, Linn.
Rare here, three specimens, March and May.

Subfamily CRAMBIDAE.

295. Diptychophora ochracealis, Wlk

Two specimens, November.

296. Eromene ocellea, Haw.

Rather common, at light, August to December. It is almost universally distributed.

297. Sedenia xeroscopa, Low.

Five specimens, September.

298. Sedenia achroa, Low.

Not uncommon, September and October.

299. Sedenia rupalis, Gn.

Four specimens, October.

300. Sedenia cervalis, Gn.

Nine specimens, September to November.

301. Sedenia polydesma, Low.

Taken occasionally, September and October.

302. Suratta hedyscopa, Low.

Five specimens, taken at light, February. They were all taken at the same time and place, yet I have not met with the species since.

303. Suratta bathrotricha, Low.

Three specimens, October and November.

304. Talis pedionoma, Meyr.

Common, March to May.

305. Talis penteucha, Meyr.

Not uncommon, March. In the original description the specific name is printed *panteucha*, in Hampson's revision *penteucha*.

306. Talis grammellus, Zeller.

Rare here, April to May, five specimens.

307. Talis acontophora, Meyr.

Common, March and April.

308. Talis longipalpellus, Meyr.

Not uncommon, March to May.

309. Talis cyclosema, Low.
Three specimens, March and April.

310. Talis crypsichroa, Low.
Rather common, March to May.

311. Talis stenipteralis, Low.
Three specimens, October.

312. Talis eremenopa, Low.
Two specimens, in March.

313. Crambus leptogrammellus, Meyr.
Five specimens, March.

Subfamily EPIPASCHIADAE.

314. Jocara thermoptera, Low.
Three specimens, March and May.

315. Astrapometis saburalis, Wlk.
Taken occasionally, March and April.

316. Macalla habitalis, Gn.
Common, November, December, and April.

317. Macalla funerea, Wlk.
Three specimens, at light, taken for the first time, March, 1915.

318. Spectatrota fimbrialis, Warr.
Taken occasionally, September.

Subfamily PYRALIDAE.

319. Aglossa cuprealis, Hüb.
Not uncommon, November and December.

320. Pyralis farinalis, Linn.
Rather common during November, February, and April.

321. Pyralis caustica, Meyr.
Occasionally in March, April, and June. The specimens are somewhat larger on the average than the type, expanding to 22 mm.

Subfamily HYDROCAMPIDAE.

322. Nymphula nitens, Butl.

Abundant some seasons, absent others, November to March.

323. Nymphula diplopa, Low.

Three specimens, October and November.

324. Musotima ochropteralis, Gn.

Taken at rare intervals, in November.

325. Musotima nitidalis, Wlk.

Not uncommon, October and November, generally taken in the garden.

Subfamily SCOPARIADAE.

326. Eclipsiodes crypsixantha, Meyr.

Taken occasionally, at light, September and October.

327. Eclipsiodes argolina, Low.

This type is still unique, taken in April.

328. Eclipsiodes epigypsa, Low.

Two specimens, in September.

329. Eclipsiodes crypserythra, Low.

Four specimens, April and November.

330. Scoparia anthomera, Low.

Two specimens, March.

331. Scoparia susanae, Low.

Not uncommon, May to June.

332. Scoparia schizodesma, Low.

Taken occasionally, August to March.

333. Scoparia anisophragma, Low.

Rather common, August and September.

334. Scoparia lichenopa, Low.

Tolerably common, April to June.

335. Scoparia mesogramma, Low.

A rare species, three specimens, August to October.

336. Tetraprosopus paracycla, Low.

One specimen (type), in November.

Subfamily PYRAUSTIDAE.

337. Zinckenia fascialis, Cram.

Taken occasionally, October and November. A widely-distributed species.

338. Nacoleia rhaeoalis, Wlk.

Not uncommon, March and September. Commonly known as *murcalis*, Wlk.

339. Lygropia xanthomela, Meyr.

Two specimens, March.

340. Glyphodes microta, Meyr.

Five specimens, February and March.

341. Hellula undalis, Fab.

Abundant, from September to May. Widely distributed. Hampson (P.Z.S., p. 760, 1898) allows *undalis*, Fab.; *hydralis*, Gn.; and *phidilealis*, Wlk., to rank as three distinct species. Mr. Meyrick considers them identical.

342. Nomophila noctuella, Schiff.

Common, nearly throughout the year. Universally distributed.

343. Metallarcha eurychrysa, Meyr.

One specimen, December, an accidental straggler. I have specimens from Hoyleton and Petersburg, South Australia.

344. Metallarcha leucodetis, Low.

Rather scarce, October and November.

345. Eurycreon massalis, Wlk.

Common, January to April.

346. Tritaea affinitalis, Ld.

Common throughout the year, except July and August.

347. Antigastra catalaunalis, Dup.

Taken occasionally, April and May.

348. Mecyna ornithopteralis, Gn.

Not uncommon, March and April. I follow Hampson in separating this species from *polygonalis*, Hüb.

349. Metasia homophaea, Meyr. (?)

One specimen, doubtfully referable to this species, November.

350. Pionea orthogramma, Low.

One specimen (type), in November.

351. Sceliodes cordalis, Dbld.

Common from September to November, and in March. The larvae probably feed in the seed-pods of *Solanum esuriale*, which is abundant here.

352. Heliothela ophideresana, Meyr.

Taken occasionally, November to March.

Subfamily PTEROPHORIDAE.

353. Doxosteres canalis, Wlk.

Taken occasionally, March and April.

TORTRICINA.

This group is only sparsely represented here, but those species taken are quite representative. A noticeable peculiarity is the absence of the very common *Tortrix postvittana*, Wlk.: but with the advent of the numerous gardens being formed, it is certain to be introduced ere long. A large proportion of those enumerated were taken at light.

Subfamily PHALONIADAE.

354. Heliocosma anthodes, Meyr.

Thirteen specimens, October. The type came from Western Australia.

Subfamily TORTRICIDAE.

355. Isochorista panaeolana, Meyr.

Taken occasionally, November.

356. Isochorista acrodesma, Low.

Five specimens, September.

357. Capua oxygona, Low.

Not uncommon, March and October.

358. Capua placodes, Low.

Three specimens, September to December.

359. Capua atristrigana, Meyr.

Four specimens, March and April.

360. Capua leptospila, Low.
Three specimens, May.

361. Epichorista petrochroa, Low.
Five specimens, October and November.

362. Dichelopa panoplana, Meyr.
Not uncommon, November.

363. Palaeotoma styphelana, Meyr.
Taken occasionally, October and November.

Subfamily EUCOSMIDAE.

364. Spilonota ejectana, Wlk.
Taken occasionally, September and October.

365. Spilonota macropetana, Meyr.
Common, at light, September to June.

366. Eucosma plebiana, Zeller.
Common, March to June.

367. Bactra optanias, Meyr.
Not uncommon, October to January.

368. Polychrosis botrana, Schiff.
Several specimens, March.

369. Laspeyresia pomonella, Linn.
Rather common, October to January.

370. Laspeyresia lomacula, Low.
Occasionally, October and March.

Subfamily OECOPHORIDAE.

This subfamily is well represented, but most of the species taken here are of sombre colouring. The genus *Philobota* occurs very sparsely, its place being taken by the genus *Nephogenes*, of which I have nearly 30 varieties. The genus *Trachyntis* is essentially Western Australian, but I have taken several new species, and feel confident that many more remain to be discovered in this district.

371. Eulechria atradelpha, Low.
Two specimens, December. The type was taken at Stawell, Victoria.

372. Eulechria leucopis, Low.
Taken occasionally, November.

373. Eulechria graphica, Meyr.
One specimen, January.

374. Eulechria actias, Low.
Taken occasionally, April and October.

375. Eulechria nepheloma, Low.
Not uncommon, November.

376. Eulechria eriopa, Low.
Nine specimens, October.

377. Eulechria pentaspila, Low.
A scarce species, four specimens, May.

378. Eulechria photinopis, Low.
A winter species, taken occasionally, July.

379. Eulechria sciophanes, Meyr.
Taken occasionally, March and October.

380. Eulechria paraleuca, Low.
Two specimens, November.

381. Eulechria autophyla, Low.
Three specimens, March and April.

382. Linosticha myriospila, Low.
One specimen, type, November.

383. Linosticha amphileuca, Low.
Two specimens, March. The type came from Birchip, Victoria.

384. Linosticha pudica, Low.
Taken at rare intervals, August.

385. Linosticha cremnodisema, Low.
Not uncommon, March and April.

386. Linosticha euadelpha, Low.
Several specimens, June.

387. Oenochrodes crossoxantha, Low.
Three females, November.

388. Trachyntis erebocosma, Low.

Several specimens, April and May.

389. Trachyntis sarcosma, Low.

Five specimens, April and May. The type came from Cockburn, South Australia.

390. Trachyntis argocentra, Low.

Taken occasionally, April.

391. Trachyntis tetraspora, Low.

Two specimens, May. Much paler than the type, which came from Derby, Western Australia.

392. Trachyntis peloma, Low.

Not uncommon, April and May. The type came from Warrego, New South Wales.

393. Phloeopola inferna, Low.

Not uncommon, March to May.

394. Nephogenes pyrocentra, Low.

Rather common, March to May; rarely in June and July.

This species varies in ground-colour, some specimens being almost fleshy-white, others fuscous to black, but the fleshy-red longitudinal streak is always clearly defined.

395. Nephogenes xipholeuca, Low.

Not uncommon, March to May.

396. Nephogenes petrinodes, Low.

Two specimens, June.

397. Nephogenes pycnoda, Low.

Five specimens, November. The type came from near Townsville.

398. Nephogenes perigypsa, Low.

Nine specimens, October and November.

399. Nephogenes centrotherma, Low.

Taken occasionally, March and April.

400. Nephogenes susanae, Low.

Rather common, beaten from *Bassia biflora*, in August.

401. Nephogenes crassinervis, Low.

Rather common, also beaten from *Bassia biflora*, August and September.

402. Nephogenes atrisignis, Low.
Taken occasionally, in May.

403. Nephogenes basatra, Low.
Rather common, August to October.

404. Nephogenes melanthes, Low.
Common, October and November.

405. Nephogenes droserodes, Low.
One specimen, type, August.

406. Nephogenes drymelanthes, Low.
Five specimens, April.

407. Nephogenes amphisema, Low.
One specimen, Wompah (on the Queensland border), November.

408. Nephogenes apora, Meyr.
Common, at light, March and April.

409. Nephogenes foedatella, Wlk.
Taken occasionally, April.

410. Nephogenes olympias, Low.
Not uncommon, October.

411. Nephogenes zalias, Low.
Taken occasionally, October.

412. Nephogenes siligmias, Low.
Rather common, October and November.

413. Nephogenes erebomorpha, Low.
Seven specimens, June.

414. Philobota habrodes, Low.
Common, March to May.

415. Philobota gonostropha, Low.
One specimen, type, May. Further material may indicate this species to be referable to *Nephogenes*.

416. Philobota oxysema, Low.
Taken occasionally, January and March. Sometimes the markings are almost obscured by whitish ground-colour.

417. Caesyra xanthocoma, Low.
Taken occasionally, September and October.

418. Caesyra pelodesma, Low.
Not common, September and October.

419. Ocystola holodryas, Low.
Rather common, at light, September to January.

420. Heterobathra xiphosema, Low.
Two specimens, August.

421. Heterobathra semnostola, Low.
One specimen, type, August.

422. Heterobathra bimacula, Low.
Two specimens, August. This and the two previous species are exceedingly scarce.

423. Aristeis macrotricha, Low.
One poor specimen, Tarrawingee.

424. Pleurota pyrosema, Low.
Five specimens, May. A rare species.

425. Saropla paracycla, Low.
Not uncommon, May and June.

426. Eucryptogona trichobathra, Low.
Taken occasionally, May and June.

427. Mimobrachyoma eusema, Low
Not uncommon, October to December.

428. Guestia actinipha, Low.
Three specimens, May and June.

429. Guestia peladelpha, Low.
Rather uncommon, at light, May to July. I took a large series on one occasion; but it is usually scarce.

430. Guestia eurybapta, Low.
Four specimens, April to June.

431. Guestia (?) ischnota, Low.
One specimen, type, September.

432. Guestia adelphodes, Low.
Three specimens, May.

433. Pauronota thermaloma, Low.
One specimen, type, July.

434. Borkhausenia maculifera, Low.
Taken occasionally, October and November.

435. Borkhausenia megaloplaca, Low.
Rather scarce, May and June. This species has the terminal joint of palpi short, and is more correctly referable to *Pauronota*.

436. Borkhausenia hypoxantha, Low.
One specimen, type, November.

437. Borkhausenia (?) erythrocephala, Low.
One specimen, type, April.

438. Borkhausenia zophosema, Low.
One specimen, type, August.

439. Mimodoxa dryina, Low.
Three specimens, October.

440. Machaeritis xerodes, Low.
Common in grassy places, October and November.

441. Macrobathra zonodesma, Low.
Three specimens, October.

442. Macrobathra syncoma, Low.
Occasionally, October.

443. Macrobathra phernaea, Low.
Three specimens, October.

444. Macrobathra gastroleuca, Low.
One specimen, type, November.

445. Macrobathra metallica, Low.
Three specimens, October.

446. Macrobathra drosera, Low.
Three specimens, October.

Notes on a High-level Occurrence of a Fossiliferous Bed of Upper Cainozoic Age in the Neighbourhood of the Murray Plains.

By Walter Howchin, F.G.S.

[Read August 10, 1916.]

In previous notices[1] the broken and fragmentary occurrences of the fossiliferous beds of Cainozoic age in South Australia have been commented upon and the great range of altitude exhibited by these beds has been used as collateral evidence in proof of locally-developed earth movements. Up to the present the evidence has been supplied mostly by the older fossiliferous series, which have been shown to give a vertical range, in successive steps, of about 2,500 feet.[2]

The upper marine series (Tate's "Miocene") does not show the same range in its respective altitudes as the lower series. The city of Adelaide is built on a platform of these beds at a height of 100 feet above sea-level. They occur in many places in the sea cliffs of Gulf St. Vincent, at about the same level, or less, and also in the cliffs of the River Murray at about 40 feet above sea-level.

The greatest elevation of the Upper Cainozoic marine beds on the western side of the ranges, so far as known, occurs near Hallett's Cove. In the cove itself the fossiliferous (?) Miocene occupies a position in the face of the cliffs, between the Permo-carboniferous till and the Pleistocene clays, at a height of 100 feet above sea-level; but at the distance of a mile inland the same beds are repeated, resting on a shelf of Upper Cambrian rocks, at a height of about 200 feet above sea-level. An additional occurrence is described in the present paper at a still greater elevation.

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(1) Howchin: "Description of a Disturbed Area of Cainozoic Rocks in South Australia," Trans. and Proc. Roy. Soc. S. Aus., vol. xxxv. (1911), p. 47; "An Outlier of Older Cainozoic Rocks in the River Light near Mallala," ditto, vol. xxxvi. (1912), p. 14; "Foraminifera and other Organic Remains obtained from Borings on the Lilydale Sheep-station," ditto, vol. xxxix. (1915), p. 345.

(2) Tate fixed the base of the Lower Cainozoic fossiliferous beds, in the Croydon bore, at 1,681 feet; so that when the height of the bore above sea-level (57 feet) is allowed for, and the height of the fossiliferous fragment on the Hindmarsh Tiers (about 900 feet above sea-level) is added, we get an extreme vertical range of these beds as 2,524 feet.

Description of the Fossiliferous Bed.

Recently my attention has been directed to a new locality for the occurrence of beds of this age situated near the Mount Mary railway station, on the Adelaide to Morgan line. At a distance of one and a half miles from the railway station, towards Morgan, at the $91\frac{3}{4}$ mile post, the line passes through two shallow cuttings, at the summit of a slight rise in the grade. The section exposed in these cuttings shows a maximum face of 7 feet, the lower 5 feet consisting of a shelly deposit, which latter is capped by layers of travertine limestone having an average thickness of 2 feet.

The shell-bed (so far as seen) consists entirely of oysters, and is apparently limited to one species, *Ostrea sturtiana*. These are in enormous numbers, being packed closely together, and with only a slight amount of inorganic bed material, the latter consisting of calcareous sand and shelly fragments. The occurrence of paired valves was found to be relatively rare, for whilst a few of these were obtained, by far the greater number occurred as separates, probably separated and distributed by wave action.

The only other organic remains that came under observation were gathered from the washed material obtained from within and around the shells. These were microzoic, and consisted of two species of foraminifera (*Rotalia beccarii* and *Polystomella crispa*), one or two valves of ostracods, and a fair number of fragments of small spines belonging to Spatangoid echinoderms.

The facies of the bed and its contents show a direct resemblance to the upper series of the River Murray cliffs, in which *O. sturtiana* is the typical and most-abundant fossil. Tate says[3]:—"This species constitutes banks up to 10 feet or more in thickness in the upper part of the River Murray cliffs, from Overland Corner to beyond Blanchetown." I cannot find that Tate has given any other record for the occurrence of the species than that of the River Murray cliffs, and this is the only locality given by Dennant in his Catalogue.[4] I have collected one or two examples at Hallett's Cove, but it is not known elsewhere in South Australia, and has not been noted outside of the State.

The restricted occurrence of this species, as compared with the countless number of individuals assembled within a limited area, is very remarkable when viewed in relation to geographical distribution, and is very difficult to explain. This particular oyster appears to have held the ground of a

[3] Trans. and Proc. Roy. Soc. S. Aus., vol. viii. (1886), p. 97.

[4] Records Geolog. Sur. of Victoria, vol. i., pt. ii., 1903.

certain area so effectively as to practically exclude all competitors and to maintain the exclusive possession for a considerable time; yet, notwithstanding its local fecundity, failed to establish itself beyond its own particular province.

The deposit, as seen on the railway, is intersected by a shallow valley, which cuts it in two. The outcrop must at one time have been continuous, but whether it has been eroded to its base by the valley or simply obscured by cover in the hollow is uncertain. The permanent way has been ballasted with the shells throughout the two cuttings, and the embankment between the cuttings has been constructed of the same material. The full length of the fossiliferous outcrop, including the intervening valley, is about 500 yards. The travertine limestone which caps the fossiliferous bed slopes, with the ground on either side of the rise, and together with the shell-bed, pass below the surface of the ground. At no point in the outcrops is the base of the fossiliferous bed seen, nor the bed-rock on which it rests; its thickness, therefore, is uncertain.

Evidence of Earth Movements.

It has been already stated that the normal height of the Upper Cainozoic marine series in South Australia is 100 feet above sea-level, or less than that. At Hallett's Cove they occur in two steps, at 100 feet and also at 200 feet above sea-level. The height of the Mount Mary railway station is given, officially, as 311 feet above sea-level, while the fossiliferous bed in that neighbourhood is 30 feet higher. The corresponding bed in the cliffs of the River Murray is thirteen miles distant from the Mount Mary bed, and has a mean elevation of 40 feet above present sea-level. The two occurrences are, therefore, not only widely separated as to location, but the one occupies a position 300 feet above the other. Notwithstanding these discrepancies in their present positions, there can be no doubt that the respective beds were deposited at the same level, and that the oysters formed a living colony in the same waters and at the same time.

In order to explain the present discordance in their respective levels, it must be assumed that a two-fold movement has taken place. First, a general uplift of the sea-bed, extending to some hundreds of feet, by which a plateau was formed; and, secondly, a collapse on the eastern side, by which the ground in that direction subsided to the extent of at least 300 feet.

The facts brought to our notice by this interesting outlier of marine beds at Mount Mary form an additional contribution to the geological history of the Mount Lofty Ranges,

and accords with the succession of events that is assumed to have taken place on the western side of the ranges. The western slopes of the dissected plateau show successive steps in which longitudinal segments have slipped down—in some cases below sea-level—forming the foothills of the ranges and the sunken areas of Gulf St. Vincent and Spencer Gulf. The Mount Mary occurrences of these beds give evidence of similar earth movements having taken place on the eastern side of the ranges as on the western. A very distinct fault-scarp faces the Murray Plains, with a north and south strike, making a line with Eudunda, Point Pass, and Robertstown. To the eastward of this fault-scarp the ground slopes away to the River Murray. Point Pass railway station, situated at the foot of the eastern scarp, is 1,249 feet above sea-level; the oyster-bed, near Mount Mary, is 340 feet above sea-level; and the corresponding bed at Morgan is 40 feet above sea-level. By the movement of elevation an old sea-bed was raised several hundred feet above sea-level, and this upward movement was followed by longitudinal fractures, in two or more steps, by which the faulted segments left the old marine sediments at different levels.

These differential movements of the earth's crust supply a certain order of succession by which we may infer their geological age. Thus the older marine beds of Cainozoic age have been more displaced and occur through a greater range of altitude than the newer marine beds of the series. These facts suggest that the earth movements had been in operation before the newer members of the series were laid down and were continued subsequently to the latter's deposition. The movements were evidently complicated, and involved alternations of elevation and subsidence.

My attention was called to the *Ostrea* bed by my nephew, Mr. E. E. Howchin, who had received his information from Mr. A. Tonkin, whose duties as an enginedriver on the Morgan railway took him daily through the cuttings where the shells are exposed.

MINERAL NOTES.[1]

By D. MAWSON, D.Sc.

[Read August 10, 1916.]

PLATE XXXI.

CONTENTS.

1, Octahedrite. 2, Twinned Gypsum Crystals. 3, Beryl. 4, Loadstone. 5, Monazite. 6, Cordierite. 7, Sillimanite. 8, Spinel. 9, Sphene. 10, Davidite.

1. *Octahedrite.*—A new and interesting locality for this mineral is at the Glen Osmond Quarry, Adelaide. It is the first reported occurrence of octahedrite in Australia. The crystals, which are of rare occurrence, are found on the drusy surfaces of fissures traversing the quartzite. It appears in acicular and obtuse octahedral forms associated with rutile. The crystal measured is a stumpy octahedron about 1 cm. long. It is capped by a basal face, and shows also the following: (117), (113), (112), (111), and (110). The faces gave sharp readings. The angle of 68° 15′ between the cleavages is characteristic. The colour is reddish-brown. The specimen measured was collected by Mr. A. C. Broughton.

2. *Twinned Gypsum Crystals.*—Mr. F. Voss Smith, manager of Block 14 Mine, Broken Hill, handed over to me the interesting twinned gypsum crystals illustrated (see plate xxxi.). They were formed in the interior of a boiler of marine type on the Westward Ho! Mine, near Manna Hill, South Australia. The water which had formed the feed for the boiler was drawn from a creek containing mineralized water. When it was cleaned out, the occasion of the finding of the crystals, the boiler had been standing idle for five years and the contents evaporated. As shown in the illustration, they are cruciform penetration twins, with the (100) as twin plane.

3. *Beryl.*—This mineral occurs in notable quantities as large isolated crystals in the quartz reefs and coarse pegmatites associated with Pre-Cambrian granite intrusives outcropping to the north of Olary, in the Boolcoomatta Hills, and elsewhere in that neighbourhood. They are faintly

[1] These notes are based on minerals exhibited before the Society during the years 1910 and 1911. Publication was deferred owing to the author having mislaid his notes before departing on his Antarctic Expedition in December, 1911.

greenish in colour, and surface specimens are always turbid and much cracked and discoloured. The crystals are usually bounded by $10\bar{1}0$ faces with irregular ends. In one case the $10\bar{1}0$ faces were bevelled by $21\bar{3}0$ faces and the ends terminated by definite basal planes. The most notable feature, however, is the great size to which they attain. The fragments of a crystal weighing 100 lb. were recovered from one outcrop.

4. *Loadstone.*—Slugs of highly-magnetic polar magnetite occur weathered out along the outcrop of a basic intrusion in the Pre-Cambrian belt about one mile to the north-east of the Woman-in-White Mine, Boolcoomatta.

5. *Monazite.*—This mineral occurs in notable quantity in association with corundum in the corundum-mica-schist between Mounts Pitt and Painter, in the Flinders Range. This formation is within two miles of the great lode culminating in Mount Gee, associated with which are the several radioactive minerals already exhibited at a meeting of this Society —namely, autunite and torbernite, with less-frequent zeunerite, gummite, carnotite, etc. The monazite-bearing rock in question outcrops as an irregular patch about a quarter of a mile in diameter and is intersected by a gorge. The neighbouring rocks have been shown to be Pre-Cambrian, and are chiefly volcanic. (*Vide* Aust. Ass. for Adv. Science Report, 1911.) The origin of the formation appears to have been the result of the action of gaseous and liquid magmatic solutions (pneumatrolysis) upon the surrounding rocks. Such a conclusion is supported by the nature of the mineral association, by the coarseness and irregularity of the crystallizations, and by the presence of much tourmaline, apatite, and monazite. The absence of silica, and the abundance of mica, cordierite, and the like, show that agent was doubtless rich in hydrofluoric acid. Massive formations of fluor spar and remarkable crystallized quartz formations elsewhere in the neighbourhood (*e.g.*, at Mount Gee) further support this theory. On this line of reasoning the Mount Gee formation is to be regarded as a later phase (further from the magma hearth) of pneumatrolysis which, in the first place, had effected the development of the corundum-mica-schist belt containing the monazite. Monazite is everywhere present in the corundum-schist, but in very variable amount. Here and there it is visible to the naked eye in the hand specimen, and aggregates up to half an inch in diameter have come under notice. It is usually embedded in or surrounded by the leaves of the mica, but where black tourmaline is abundant is often embedded in the tourmaline. Crystalline facets are commonly shown on the grain-like individuals. The

colour varies from light honey-yellow to a reddish-brown. Two samples, obtained by the bulk concentration of the ore on a Wilfley dry table, were submitted to Mr. J. C. H. Mingaye, who kindly analysed them and obtained the following results:—

	Sample 1.	Sample 2.
Rare earths of the Cerium Group as oxides	25·04 %	66·48 %
Thoria (ThO_2)	0·20 %	0·16 %

The No. 2 sample was much more free from admixture of other mineral matter. Both will be noted to be unusually poor in thoria.

6. *Cordierite.*—Associated with the corundum-schist, already referred to, near Mount Pitt, is cordierite-rock. On account of the abundance and excellence of the material this forms a notable occurrence of the mineral. The distribution is irregular throughout the zone affected by pneumatolysis, but is more abundant and appears in distinct bands in the peripheral belt. Usually it is admixed with corundum, sillimanite, and some mica; but in places outcrops of almost pure cordierite-rock appear. Where there is much cordierite the corundum is pink. Some perfect double-ended hexagonal pyramids of pink corundum have been met with embedded in the cordierite. In one place the rock is about half-pink corundum and half cordierite, and there lumps of corundum many pounds in weight were got. Normally, it is of a waxy appearance and a brown colour, but is also found very light-coloured and even black. Its microscopic characters are normal and the pleochroic halos are beautifully shown.

7. *Sillimanite.*—Microscope sections show this mineral to occur in notable amounts in association with the cordierite just described. It is normal in character. This is probably the most important occurrence of this mineral yet recorded in South Australia.

8. *Spinel.*—Large octahedral crystals of the spinel, *pleonaste*, are frequent in the corundum-mica-schist belt near Mount Pitt. They are opaque, and reach an inch in diameter. The octahedral form is perfect. The composition of the spinel appears to vary in different portions of the outcrop, but the prevailing type is best described as a pleonaste. The crystals are often embedded in the soft mica and can easily be isolated.

9. *Sphene.*—Mr. Greenwood was the first to bring in specimens of this mineral from the Mount Painter district. These were examined chemically and identified by Mr. W. T. Chapman, of the Mines Department. An examination of the

outcrop from which these specimens were derived proved the rock to be a very coarse-grained igneous injection, perhaps best described as a gabbro-pegmatite. It outcrops in the Pre-Cambrian area on the creek about a mile below Mount Gee. The sphene crystals are of a clove-brown colour, and some were discovered that weighed several pounds. They are embedded in a coarse uralitized-diopside. The formation recalls the "yatalite" of Benson, from the Pre-Cambrian area near Adelaide.

10. *Davidite.*—In a preliminary notice [2] concerning radio-active minerals from the Radium Hill lode, near Olary, the name davidite was suggested for one of them. Since that date mining operations have opened up the lode and exposed additional features of interest. A special contribution on the subject will be forthcoming shortly, but in the meantime further reference to the association and identity of davidite is due. The davidite in its pure form is but rarely met with in the lode. It is in the form of streaks, grains, and crystals embedded in the other filling. The latter is chiefly radio-active ilmenite of a non-homogeneous character. In places grains and patches of pure rutile appear. Occasionally in the more massive portions of the lode stringers of quartz, centrally disposed, make their appearance. Embedded in such quartz nice cuboid crystals of davidite are to be met with. In thin sections, under the microscope, these crystals appear homogeneous, and there is no evidence that they are a mechanical mixture of mineral ingredients. An analysis by Dr. W. T. Cooke of some of this material is published elsewhere. [3] The radio-active ilmenite forming the general lode-filling becomes blacker and duller in the deeper zones, and at the same time is more highly radio-active. The principal change is that of decrease of titanium and increase in iron and uranium. In certain pockets and apophyses the filling is mainly coarse, intensely black biotite, [4] through which the radio-active mineral is distributed as nodules. These latter commonly contain 8 per cent. U_2O_3. The mineral composing these nodules weathers comparatively readily, and, as met with, is often in the state of brown, earthy aggregates. On the spoil heap, where the micaceous gangue has been dumped at the mouth of the shaft, a growth of carnotite is to be observed developed on the flakes of black biotite subsequently to reaching the surface. The biotite thus becomes, in the course

(2) *Vide* Trans. and Proc. Roy. Soc., S. Aus., 1906.

(3) *Vide* Trans. and Proc. Roy. Soc., S. Aus., present volume, p. 267.

(4) *Vide* Report by R. E. Stanley: Trans. and Proc. Roy. Soc., S. Aus., present volume, p. 268.

of several months, coated more or less with mustard-yellow carnotite. A sooty coating in two fissures in the lode, and also smearing some of the coarse biotite, was found to be very highly radio-active. In appearance the coating suggested oxide of manganese. It completely dissolves in weak acid. A rough test showed it to be almost entirely oxide of uranium. This apparently is the first report of the occurrence of uranic oxide free in nature. The formation of the carnotite at the surface, in the dump heap, appears to depend upon the presence of this uranic oxide in the gangue. In the surface portions of the lode a micaceous mineral in tiny green scales occurs in places. At the time of writing the preliminary note [5] it was suggested that this might prove to be roscoelite. Examination is hampered by the minute quantity available, but it certainly is not roscoelite, inasmuch as the absence of vanadium has been proved. Uranium also is absent, but it does contain 6·8 per cent. of Cr_2O_3 (chromic oxide). The 16 lb. block of lode matter which formed the basis of the report [6] by T. Crook, F.G.S., and G. S. Blake, B.Sc., F.C.S., contains no typical davidite that can be observed by the naked eye. Their reports deal comprehensively with what the block sample contained—namely, carnotite and the massive non-homogeneous radio-active ilmenite, which composes the body of the lode. [7] It may be also that the block contains some davidite in microscopic quantities. As already mentioned, davidite occurs elsewhere in the lode in the form of rough crystals, which are microscopically homogeneous. The conclusions of Crook and Blake that davidite is a non-homogeneous substance is, therefore, not valid.

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[5] Trans. and Proc. Roy. Soc. S. Aus., 1906.

[6] "On Carnotite and an associated mineral complex from South Australia," Min. Mag., March, 1910, vol. xv.

[7] Note made upon personal inspection of the block.—D. M.

Chemical Notes on Davidite.

By W. T. Cooke, D.Sc., University, Adelaide.

[Read August 10, 1916.]

A preliminary note by Professor Rennie and myself on certain radio-active minerals from Olary appeared in these Proceedings in the year 1906. Of the ferriferous and titaniferous radio-active constituents of the lode, the one referred to as *Davidite* is the most interesting, as it is homogeneous and is a distinct species (*vide* "Mineral Notes," by Dr. Mawson, in this volume, p. 262). The bulk of the lode, however, is a mechanical and chemical mixture of ilmenite, magnetite, rutile, and davidite.

Analyses of davidite gave the following figures:—

TiO_2	54·3
FeO	16·0
Fe_2O_3	13·0
Rare earths	8·3
V_2O_5, Cr_2O_3, and U_3O_8	4·6
MgO	0·6
CaO	1·5
PbO	1·1
CuO	trace
H_2O	1·5
Total	100·9

The rare earths contain very little thorium, but much cerium. The presence of lanthanum, didymium, erbium, and yttrium was shown by chemical and spectroscopic tests. Most of the 4·6 per cent. included under vanadium, chromium, and uranium oxides is due to the last-named element.

Zirconium is absent.

Scandium.—Sir William Crookes has by spectroscopic analysis found that scandium is present. [1]

Davidite readily gives off helium in quantity when heated to a red heat; 100 grams yielding about 15 cubic centimetres of fairly pure helium.

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[1] Private communication from Dr. Mawson.

A Noteworthy Occurrence of Biotite Mica.

By Evan R. Stanley, F.G.S., Government Geologist, Papua.

[Read August 10, 1916.]

This mica occurs as a constituent of the radio-active ilmenite-bearing lode in the Pre-Cambrian formation at Radium Hill, situated about twenty miles east-south-east of the Olary railway station. There is a considerable amount of quartz and radio-active minerals associated with it, the most obvious of the latter being carnotite. This carnotite appears to have some connection with the black mica, and so, on the suggestion of Dr. D. Mawson, a separation, analysis, and optical determination have been made. Close to the lode, but not directly associated with it, is a coarse mica vein, dark greyish-green in colour, apparently different from the black mica in the lode itself. Both these micas, when exposed to atmospheric conditions for a period of a few months, become coated with carnotite, and therein lies the special interest which they possess.

Microscopic Characters.

The mica is jet-black in colour and possesses the usual perfect cleavage parallel to the (001). In thin sections it is light greenish-brown in colour and strongly pleochroic, the pleochroic scheme being as follows:—

$\mathfrak{a}$ = very dark-greenish sepia.
$\mathfrak{b}$ = greenish-yellow.
$\mathfrak{c}$ = yellowish-brown.

The extinction is practically straight, being parallel to the cleavage traces.

In convergent polarized light a small optical axial angle is seen. This angle was determined roughly by comparing it with the optical axial angles of known minerals on a prepared scale. It was found to be approximately 30°, approaching that of aragonite. It is optically negative and $\rho < v$.

The mica contains numerous light-brownish-coloured needles, arranged in a symmetrical manner, making angles of 60° with one another. They have a straight extinction and a strong double refraction, which suggests that they are probably rutile. This conclusion is supported by the analyses which follow. These characters, taken in conjunction with the results of analyses set out below, indicate this mica to be a biotite. The plates are large, and the occurrence is a notable one.

The plates are also traversed by occasional small veins of quartz, which have evidently replaced some of the biotite, leaving the rutile inclusions unattacked and *in situ*.

Associated, but not in direct contact with the lode, is a very coarse lighter-coloured mica, which, in thin sections, has a light-greenish colour and is only slightly pleochroic, whilst other sections are practically colourless. Its optical axial angle is about 35°, the optical character negative and $\rho < v$. It contains a great many more inclusions than the mica of the main lode. It appears to approach the composition of a phlogopite.

Preparation of Sample for Analysis.

A quantity of the purer undecomposed mica of the lode was separated by hand-picking. As separated, it contained a considerable quantity of ilmenite and fine quartz as impurity. The mica was then ground to suitable size for treatment with heavy solutions. The next step was to subject it to the action of a strong electro-magnet, which separated a considerable quantity of the magnetic constituents. The residue was then placed in a Brögger separating funnel and a solution of cadmium-boro-tungstate poured in, the contents shaken up, and allowed to stand for some time. The material separated into two layers; the upper lighter-coloured layer contained a little mica, with a high percentage of quartz; the lower layer contained considerable mica and rutile, with a little ilmenite. The lower layer was detached and again treated with the cadmium-boro-tungstate, which resulted in a further separation of quartz. The heavy solution was then slightly diluted and agitated, resulting in a rough separation of the mica from some heavier mica, containing inclusions of rutile and ilmenite. This process was repeated several times until a mica of mean specific gravity was obtained, as free as possible from the presence of these heavier minerals. The mica was well washed with hot distilled water and dried at a 105° C.

During the above separation, indicators were from time to time thrown into the solution to ascertain the specific gravity. Microscopic investigation revealed the fact that the mica contained numerous rutile needles, and some fragments of mica contained more than others, consequently it was difficult to ascertain exactly the specific gravity of the pure mica. The specific gravity was found to lie between 2·95 and 3·07.

Next, the mica thus separated was treated with dilute hydrochloric acid, washed and dried, to dissolve off any carnotite which may have been present. Thus prepared, the mica showed no apparent radio-activity when tested in a very sensitive electroscope.

Chemical Analyses.

RESULTS OF ANALYSES.

	1	2	3	Mean.
SiO_2 ...	—	38·69	38·63	38·66
Al_2O_3 ...	17·38	17·28	17·33	17·33
Fe_2O_3 ...	9·85	9·82	9·88	9·85
FeO ...	5·55	5·64	5·60	5·59
MgO ...	15·04	14·90	14·97	14·97
CaO ...	*nil*	*nil*	*nil*	*nil*
Na_2O ...	—	—	2·76	2·76
K_2O ...	—	—	5·59	5·59
H_2O ...	—	—	2·47	2·47*
TiO_2 ...	0·64† 0·62†	1·94‡	1·96‡	TiO_2 { 0·03§ / 1·32‖
Cr_2O_3 ...	—	0·61	0·61	0·61
MnO ...	—	—	trace	trace
Fl ...	—	—	0·77	0·77
V_2O_5 ...	—	—	trace	trace

Total	99·95
Oxygen equivalent ...	0·32
Corrected Total ...	99·63
Multiplying factor for adjustment ...	1·013

*Loss on ignition chiefly. †Two separate results of combined TiO_2.
‡Total titanium. §Chemically combined. ‖Included rutile.

CORRECTED ANALYSIS,

after eliminating included rutile.

SiO_2	39·16
Al_2O_3	17·55
Fe_2O_3	9·97
FeO	5·66
MgO	15·16
CaO	*nil*
Na_2O	2·79
K_2O	5·66
H_2O	2·50
TiO_2	0·64
Cr_2O_3	0·62
MnO	trace
Fl	0·78
V_2O_5	trace
	100·49
Oxygen equivalent	0·32
Total	100·17

A weighed portion of the prepared mica was decomposed by hydrofluoric and sulphuric acids in a closed platinum crucible in an atmosphere of carbon dioxide, and then titrated by standard permanganate solution for ferrous iron. Then the solution was reduced by sulphuretted hydrogen, boiled in an atmosphere of carbon dioxide, and again titrated for total iron. Finally, the same solution was used for the determination of titanium chemically combined in the mica. By taking some of the pure powdered rutile and treating it with hydrofluoric and sulphuric acids for some time in a platinum crucible, there was no indication of any colour when hydrogen peroxide was added, consequently these acids have little, if any, action upon rutile under the conditions. Hence the titanium estimated by this method is present chemically combined in the mica itself, and not as inclusions.

Microscopic examination revealed the presence of many needle-like inclusions of rutile, but apart from these the mica itself contains over 0·60 per cent. of TiO_2.

The total titanium was estimated from another portion by fusing with alkali carbonates. From this portion also the silica, total iron, magnesia, lime, and manganese were estimated by the usual methods.

Having obtained total TiO_2, the combined TiO_2 previously estimated was subtracted, indicating over 1·30 per cent. of rutile included in the mica. In calculating the corrected compositions of the mica, allowance was made for the included rutile.

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University, Adelaide.

Notes on Some Miscellaneous Coleoptera, with Descriptions of New Species.—Part II.

By Arthur M. Lea, F.E.S., Museum Entomologist.

[*Contribution from the South Australian Museum.*]

[Read September 14, 1916.]

Plates XXXII. to XXXIX.

CUCUJIDAE.

Nepharis.

This genus has been transferred from the *Colydiidae* to the *Silvanides* of the *Cucujidae* by Grouvelle (Ann. Soc. Ent. Fr., 1912, p. 320), who also (p. 322) proposed a new genus *(Nepharinus)* for *N. goudiei*. I have now to describe another remarkable species of the group, recording it for the first time from Queensland.

Nepharis doddi, n. sp.

Castaneous, upper-surface somewhat darker than under. *Head* wide, almost flat, each side with a feeble longitudinal depression; with rather small punctures, becoming denser and larger about base; each side with a conspicuous notch at the position of the eye. Antennae clavate. *Prothorax* wide, evenly convex along middle, sides flattened and each with from ten to fifteen serrations, the apical one more sharply defined than the others; punctures as on base of head. *Scutellum* widely transverse. *Elytra* about the width of prothorax, parallel-sided to near apex; finely striate, the interstices each with a row of punctures; with wide margins of almost even width throughout. *Under-surface* with sharply-defined punctures, varying from rather small on flanks of prosternum to rather coarse on abdomen. *Femora* stout, strongly dentate. Length, $2\frac{1}{4}$-$2\frac{1}{2}$ mm.

Hab.—Queensland: Cairns district, three specimens from nest of a small red ant of the genus *Pheidole* (F. P. Dodd). Type, I. 5772.

The absence of prothoracic costae associates this species with *serraticollis*, from which it is distinguished by its smaller size, much smaller punctures, head wider and scarcely notched in front, and margins of elytra not notched at apex. Seen from below, each side of the head appears as a wide thin flange, with the interspace moderately elevated, coarsely

punctured, and acting as a partial protection for the antennae; the eye on each side is protected at the rear by an almost spiniform process, and is very distinct from below and but little visible from above.

Eutermicola, n. g.

Head almost concealed from above, almost vertical and flat; clypeus with sutures completely obliterated; labrum short, strongly transverse. Eyes small, subreniform, coarsely granulated, concealed from above. Palpi short and stout, apical joint of each subelliptic and obliquely truncate at apex. Antennae apparently eleven-jointed, slightly thickened in middle, joints closely applied to each other, basal one concealed from above, the others each with a ring of bristles. *Prothorax* strongly sculptured. *Scutellum* short and transverse. *Elytra* strongly sculptured, parallel-sided to near apex. *Prosternum* with front margin incurved to middle. Mesosternum very short. Metasternum about as long as basal segment of abdomen along middle, episterna parallel-sided. *Abdomen* composed of five segments, first along middle conspicuously longer than second, but from about middle of coxae just as long, second slightly longer than third, and third than fourth, fifth about once and one-half the length of fourth. *Legs* rather short and stout; front coxae inserted about one-fourth from base of prosternum, separated by a short and narrow intercoxal process, hind coxae stout, almost touching sides of abdomen; femora grooved on apical half of under-surface, edentate; tibiae short, slightly dilated at apex, which is notched on one side to receive base of tarsi, and with two small spurs; tarsi thin, joints closely applied together and almost parallel-sided, claws thin, simple, and widely diverging.

A highly-remarkable genus, which I refer to the vicinity of *Nepharinus* (principally on account of the antennae), but for which quite possibly a new family should have been proposed. The joints of the antennae are so closely articulated that it is difficult to count them, but they appear to be eleven in number. The tarsi, under a Coddington lens, appear to be parallel-sided and almost non-articulate, and certainly no joint is bilobed; but under a compound power the front ones appear to be five-jointed, the joints slightly narrowing to the fourth, the first joint seems to be slightly longer than the second or third, the fifth from some directions appears to be composed of two joints, of which the basal one is the length of the fourth, but this is due to a few setae. I have found it quite impossible to count the number of joints of the four hind tarsi, as the basal portion is quite

concealed and certain transverse impressions may belong to the tips of the joints themselves or to impressions across their middle. The body is winged.

EUTERMICOLA SCULPTICOLLIS, n. sp.

Pl. xxxii., fig. 1.

Castaneous, elevated parts of upper-surface, antennae (tip excepted), and knees darker.

Head densely longitudinally and obliquely strigose on basal half, front half highly polished and impunctate or almost so. Antennae about as long as the front of the prothorax is wide, all the joints, except the apical one, transverse, apical joint flavous, about as long as wide and distinctly narrower than the preceding one. *Prothorax* longer than the apex is wide, apex finely margined, with four longitudinal elevations commencing near the apex, parallel with each other for some distance but not to base; with a wide and deep excavation on each side of basal half; basal two-thirds longitudinally strigose and somewhat asperate. *Elytra* the width of base of prothorax, parallel-sided to near apex, which is widely rounded; each with a conspicuous ridge commencing at base just outside of the scutellum, and continued almost to apex, the space between it and suture strongly sloping downwards on basal half, but almost flat posteriorly; an acute carina commencing on each shoulder and deflected downwards towards apex, between the two acute carinae two others, almost as distinct beyond the middle, but becoming very feeble and within a depression towards base, where also there is another one which vanishes before the middle; surface in places finely rugose and without distinct punctures. *Prosternum* with numerous transverse corrugations. Abdomen minutely punctate in middle, more noticeably at sides. Length, 3-3½ mm.

Hab.—North-western Australia: Derby, from nests of *Eutermes (palmae*, Frogg., M. S.). Type, I. 5771; co-type in Western Australian Museum, No. 7486.

The two median elevations of the pronotum are in the form of narrow parallel costae on their apical half, but towards the base they angularly diverge from each other and then converge till they almost meet at the base, the outer elevation on each side is similar to the inner ones for some distance, but is then thickened and strongly curved, the curved portion causing a bulging appearance near the base and marking the outside of a large excavation traceable almost to the middle of the base; the junction of the pronotum and prosternum is marked on each side by a narrow carina that terminates in a foveate depression below the

swollen basal portion. Mr. W. D. Dodd obtained six specimens, in company with a friend who also obtained one, and sent it to the Western Australian Museum. Very few species of beetles have been obtained from nests of white ants in Australia, but such as have been are nearly all of exceptional interest.

LUCANIDAE.

Lissapterus tetrops, n. sp.

♂. Black, parts of legs and of antennae obscurely diluted with red.

Head very wide, each side bilobed, the posterior lobe with coarse, crowded punctures, sides about base with large round punctures, elsewhere smooth and impunctate; each eye completely divided by the canthus and distant about its own diameter from the side. Mandibles strongly arched, when clenched enclosing a space about one-third the size of head, tips obtusely pointed, inner-side about middle obtusely bicuspidate. Three apical joints of antennae wider, but of much the same shape as the preceding ones. *Prothorax* almost twice as wide as long, sides increasing in width from base to near apex, front angles produced and slightly rounded; sides channelled and with numerous fairly large punctures, somewhat similar punctures about base, elsewhere with sparse and minute ones. *Scutellum* smooth, with a few punctures. *Elytra* the width of prothorax at base, from about middle rounded; with punctures at extreme base, on margins and on apical slope, elsewhere impunctate or almost so. Front *femora* with a narrow ridge ending in an obtuse tooth; front tibiae with two strong teeth, and from three to six smaller ones, the other tibiae acutely dentate about middle and apex. Length (including mandibles), 24-30 (♀, 23-24) mm.

♀. Differs in having the head much smaller, with a greater portion of each side coarsely punctured, mandibles much shorter, with coarse punctures on upper-surface, prothorax with sides less dilated to near apex, front tibiae with fewer and smaller teeth and hind tibiae not dentate at apex (although the apical spurs are as long as those of the male).

Hab.—New South Wales: Barrington Tops, under logs at an elevation of 4,800 feet (H. J. Carter, A. Musgrave, and T. G. Sloane). Type, I. 5770 (co-type, K. 37,719 of Australian Museum).

The male differs from the male of *hovittanus* in being less convex, in the very different forehead (this being smooth and gently depressed in the middle instead of overhanging), each side of head bilobed (instead of trilobed), and the

punctures throughout the upper-surface smaller and distributed over smaller areas. The female differs from the female of that species in being less convex, with smaller and sparser punctures, sides of prothorax less rounded, and shoulders less produced. From the description and figure of the female of *peloridis* (the only sex of that species at present described) it differs in having the prothorax nonfoveate and the eyes completely divided by the canthi (so that there is an upper, and an under, one on each side of head), joints of antennae and the tibiae somewhat different. On one (only) of the four males before me there is a small fovea in the exact centre of the forehead. The cusps of the mandibles are placed one above the other, but on one specimen they are represented by feeble swellings only, whilst on another the upper one only is present, but is enlarged and produced upwards as a subconical tubercle. The elytra, when quite free from grease, are seen to have very feeble rows of minute punctures, but these are usually concealed; they have a few fine irregular scratches.

SCARABAEIDAE.

Bolboceras.

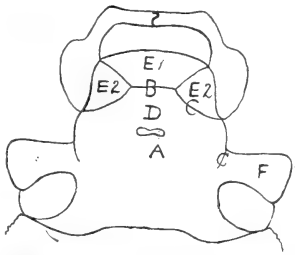
The sexes of the larger species of this genus are so strikingly distinct that without certain information it is in most instances quite impossible to mate them, and to attempt to mate specimens from widely-separated localities (although many of the species are very widely distributed) on mere general resemblance of the non-sexual parts is almost certain to result in error, and has been the cause of several mistakes in the past. Of Blackburn's groups, the first, and the first part of the second, consist of species whose females are generally very much alike and difficult to distinguish; the second part of the second group contains species whose females are usually quite as distinct (or even more so) than their males; the third group consists of small species without conspicuous horns on either sex; Blackburn remarked of it that there was "either very little external difference between the sexes, or the difference is of a kind that leads to the supposition of the two sexes being distinct species," and he thought it possible that he had described the sexes of some species as distinct ones. I think it is extremely probable that he and others have done so, and until the sexes can be mated to a certainty it appears to be actually preferable to name the sexes as distinct rather than to incorrectly mate them; but not being able to confidently mate specimens of even one of many species before me, I prefer to leave the group untouched.

Although the majority of the Australian species may be readily referred to Blackburn's groups, a rather more natural grouping would appear to be as follows:—

1. Blackburn's Group 1 (several species have but one of the two characters noted for this group) and the first part of Group 2 (except *proboscideum*).
2. The second part of Group 2.
3. One species—*proboscideum*.
4. Blackburn's Group 3.

In his revision of the genus he had occasion to give distinctive names to certain parts of the head. To make these easily recognisable a figure of the head of *truncatum* is given here. The names that he used are as follows:—

A. Frontal elevation (a tubercle, horn, or ridge).
B. Clypeal elevation (usually a carina).
CC. Frontal margins (also usually a carina).
D. Frons (usually a more or less depressed space).
E. Clypeus. 1. Middle area. 2. Lateral areae.
F. Frontal wing (an enlarged canthus).



Bolboceras truncatum.

Usually the parts named are readily traceable, but specific and individual variations are numerous. On the female of *truncatum* the clypeal elevation is frequently in the form of an acute carina, but it gradually disappears till on some specimens the clypeus and the frons are without a dividing line or suture, although the lateral areae are marked off by acute carinae.

Bolboceras proboscideum, Schreib.

Pl. xxxiii., figs. 37 to 42.

Bolboceras proboscideum, Schreib.: Trans. Linn. Soc., 1802, p. 189, pl. xx., fig. (male) 2; Westw.: *l.c.*, 1848, p. 13, pl. iii., fig. (female), 1; W. S. Macleay: Hor. Ent., i., p. 122; Griff.: Anim. Kingd. Ins., pl. xl., fig. (male) 4; Frogg.: Aust. Ins., pl. xvii., fig. (male), 1.

Australasiae, Kirby: Trans. Linn. Soc., 1818, p. 462, pl. xxiii., fig. (female) 5.

var. *Kirbyi*, Westw. (*nec* Hope, *nec* Bainbridge): *l.c.*, 1848, p. 13, pl. iii., fig. (male) 2.

var. *terrae-reginae*, Blackb.: *ante*, 1899, p. 25; Proc. Linn. Soc. N.S. Wales, 1904, p. 483.

The wonderful variation in the structure of the clypeus of the male of this species is without parallel in the Australian

Scarabaeidae. In general it may be noted as having a rostrum-like prolongation of a dilated and angular basal portion; the basal portion usually has a semi-double tubercle in the middle of its base, but this may be sometimes extended until it is on the apical portion; the basal portion varies from about one-fourth longer than the apical portion to less than half its length. The tip may be simple, produced downwards in a subconical process, or in a more or less conspicuously bifid one. The lower-surface from the tip may be continued in a more or less even curve to the base, or distinctly inflated from just beyond where the apical portion commences; but in one form (pl. xxxiii., fig. 38) there is an elongated, narrow, bifid process attached to the lower surface near the base; on this form the apical portion is always long, with its tip turned down and conspicuously bifid; it appears to be the typical one, but is much rarer than many of the others. I have seen no specimen with the lower process small or simple.

Hab.—Queensland, New South Wales, Victoria, South Australia.

BOLBOCERAS BAINBRIDGEI, Westw.

Pl. xxxiii., figs. 61 and 62.

The type of this species, as described and figured by Westwood, was a female, not a male, as he presumed; the male differs in having the concave portion of the prothorax larger, deeper, with much sparser punctures, and with the horn in front much larger; the head is very different, being widely flattened (or feebly concave) and impunctate between the eyes and a distinct tubercle behind each of these, the space in front of the eyes is also flattened, but with a distinct upward trend, with coarse punctures and without upright tubercles, but each side in front produced into an acute process overhanging the mandibles. On one small male, however, the frontal processes and the horn on the prothorax are smaller. The colour of both sexes varies from light castaneous to dark reddish-brown.

Hab.—Western Australia: Warren[1] and Swan Rivers.

BOLBOCERAS TAURUS, Westw.

B. puncticolle, Macl.

Pl. xxxiii., figs. 52 and 53.

The above synonymy, as given by Blackburn, appears to be correct; but he referred the species to his second group, although the front margin of the prothorax is deeply bifoveate (a character noted by both Westwood and Macleay).

[1] Several pairs, sent at the same time, by Mr. W. D. Dodd.

No doubt he considered the bicarinate (instead of multicarinate) hind tibiae as of more importance than the foveae.

Bolboceras frontale, Guer.

I have not seen the descriptions and figure of this species by Guerin and Klug, but a specimen sent from the British Museum, as compared with the type of *frontale*, is certainly a male of *serricolle* (given as a synonym of *frontale*), and the sexes of which were correctly described by Bainbridge. Many mated pairs of the species were taken at Beverley by the late Mr. F. H. du Boulay; of these the male usually has the prothoracic horns almost equilaterally triangular, but varying till combined they are but little more than a notched transverse ridge, as on some females; some males, on the other hand, have the horns porrect and much more acute. The elevations on the head also vary in size, but the deep prothoracic excavations are always very conspicuous on the males.

Bolboceras carpentariae, Macl.

This species occurs in several parts of Northern Queensland and of the Northern Territory, and is variable in size and sculpture. On the typical form the prothoracic horns are small, and arise from an almost evenly convex surface; the front margin of the prothorax has two small, deep foveae, and the hind tibiae are multicarinate; the cephalic horn is about as long as the space between the eyes. The extreme form of the species has the cephalic horn much longer (fully twice the width of the head), the prothorax with the horns longer (almost the width of the head), and the space behind same obliquely flattened instead of evenly convex. I am unable to distinguish its female from the female of *cornigerum*, and several males before me seem to be connecting links between the two species.

Bolboceras trituberculatum, Bainb.

The female figured by Westwood as belonging to this species was incorrectly identified. There are in the Museum several specimens of both sexes, sent (mated) by the late Mr. F. H. du Boulay from Beverley. The female differs from the male in having two small subcontiguous tubercles on the middle of the head, the prothorax non-tuberculate, and with two transverse curved carinae not quite enclosing a somewhat elliptic space, the hind one of which is much more distant from the base than that of the male. The specimen he figured (figs. 6, *a* and *b*) as *septemtuberculatum* is quite evidently not that species, and probably was a slight female variety of *trituberculatum*.

Bolboceras pontiferum, Blackb.

A specimen from Western Australia in the National Museum agrees perfectly with the type in the tubercles and excavations of the prothorax, but has the cephalic horn much longer (about thrice as long as the distance between the eyes) and with its tip conspicuously forked.

Bolboceras armigerum, Macl.

A specimen from Queensland, in the National Museum, apparently belongs to this species, but has the median tubercles of the pronotum slightly closer together and stouter than usual, with the cephalic horns very different, the median one being much longer than usual and the lateral ones somewhat shorter; the lower front angles of the prothorax are also much more acute. Fig. 43, pl. xxxiii., is of the normal form, 44 of the variety.

Bolboceras variolicolle, Lea, var. (?)

A specimen from Queensland (Maranoa) in the National Museum is somewhat smaller (15 mm.) than the type of *variolicolle*, and has the prothoracic margins much less conspicuously serrated, the ocular canthi smaller, with their outer angles rounded off, the middle and lateral areas of the clypeus confused together owing to the absence of internal boundary lines, the frontal elevation consisting of a longer and not semi-double horn, and the front face of the clypeus much less elevated. Judged by their heads alone, this specimen and the type of *variolicolle* would appear to belong to two species, but the four processes on the pronotum of each are so closely in agreement that, knowing but one specimen of each, and allowing for the very considerable variation that occurs on the heads of many species, it does not appear desirable to describe the Maranoa specimen as new. A figure (pl. xxxiii., fig. 45) of the front view of the clypeus is given for comparison with that of the type (Proc. Linn. Soc., N.S. Wales, 1915, pl. xlviii., fig. 2).

Bolboceras insigne, n. sp.

Pl. xxxiii., figs. 46 and 47.

♂. Bright castaneous. Under-surface densely clothed, lower portion of cephalic horn with a few straggling hairs.

Head with a long and suberect horn, its base and the clypeus with dense but rather shallow punctures; canthi concave; mandibles with a subtriangular extension near apex. *Prothorax* with a large medio-frontal excavation, curvilinearly deepened at each side, a moderately long, curved

horn on each side near the excavation, middle with a stout semi-double projection slightly overhanging the excavation; sublateral foveae rather large, sides with punctures as on front of head. *Scutellum* impunctate. *Elytra* with small punctures in striae, of these the thirteenth and fourteenth not conjoined towards the base. Front *tibiae* with five teeth, hind pair with two or three small and two wide carinae. Length, 22 mm.

♀. Head with a subconical elevation crowned with two small tubercles between eyes, frontal margin elevated into a subconical tubercle above each antenna; lateral areae with the front carinae curved round so as to become conjoined to the supra-antennal tubercles, instead of touching the front angles of the clypeus. *Prothorax* obliquely flattened in middle of apex, the slope crowned by a transverse bisinuate ridge, whose ends are directed towards the front angles; with two small, deep, but somewhat transverse, marginal foveae in front; with dense and coarse punctures connecting the sublateral foveae.

Hab.—Western Australia: Walkaway. Type, 1914; 863 in the Western Australian Museum.

The foveae on the front margin of the prothorax of the male are not deep and circular as on other members of Group 1, but they appear as deeper parts of the large excavation; on the female, however, they are deep and isolated, and as the hind tibiae have two or three small carinae, in addition to the two wide ones, there need be no hesitation in referring the species to Blackburn's Group 1. I think the prothorax should be regarded as having only three horns, as the median one, although feebly double at its apex, is supported on a single base, very different to the two conspicuous median horns of *tenax*, *armigerum*, and *quinquecorne*. This character alone will readily distinguish it from all the other males of its group. The female in general appearance is close to many others, but in Blackburn's table would be associated with *cornigerum*,[2] from which it differs in the median semi-double elevation of head free from any carinae. On the male the cephalic horn is about as long as the head is wide across the canthi; on the female the lateral areae of the clypeus, although completely enclosed by carinae, have but two of these, instead of three.

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[2] In that table *cornigerum* was separated from *hippopus* by punctures of the interstices, but evidently the word interstices was accidentally used for striae; all the specimens in the Museum are without punctures on the interstices, but are punctate-striate, whereas on *hippopus* they are striate only.

Bolboceras quinquecorne, n. sp.

Pl. xxxiii., fig. 50.

♂. Castaneous, some parts darker than others. Under-surface densely clothed, lower portions of cephalic horn with straggling hairs.

Head with a rather long suberect horn, its lower two-thirds and the clypeus with dense but rather shallow punctures; carina on its lower front distinctly elevated in the middle; canthi feebly concave; mandibles notched towards apex. *Prothorax* with a wide, transverse, frontal excavation, with four subconical horns overhanging same, between same and base two rather large pear-shaped foveae; sublateral foveae fairly large; sides with dense punctures as on front of head, with larger shallow punctures irregularly distributed, and with minute ones scattered about; a shallow median line, but with conspicuous punctures on basal half. *Scutellum* impunctate. *Elytra* striate-punctate, thirteenth and fourteenth rows conjoined towards base. Front *tibiae* with five teeth, hind ones with two small irregular subbasal carinae in addition to two large ones. Length, 23 mm.

Hab.—Northern Territory: Tennant Creek (J. F. Field). Type, I. 3699.

Allied to *tenax* and *armigerum*, but head with a single elongated simple horn; from *tenax* also it differs in the two median horns of the prothorax being much closer together; this should distinguish it also from *froggatti*, which is stated to have the two median horns wider apart than in *tenax*; the clypeus is much as on *tenax*, and both mandibles are conspicuously sinuate, characters which should also be distinctive from *froggatti*. On the front margin of the prothorax there is a small fovea towards each side, but it is not deep as in Group 1; the hind tibiae might be regarded as somewhat similar to those of Group 1, but the clypeus is certainly as on the first subgroup of Group 2; the species, however, is so obviously allied to *tenax* and *armigerum* that it should be associated with them in any table.

Bolboceras trifoveicolle, n. sp.

Pl. xxxiii., figs. 48 and 49.

♂. Castaneous. Under-surface densely clothed.

Head with three conspicuous, but not very long, erect horns between antennae, the outer ones subconical, the median one truncated or semi-double at its tip; front portion of clypeus almost vertical and somewhat elevated in middle; with crowded punctures, except towards base, where they are small and sparse; canthi shallow; mandibles sinuous towards apex. *Prothorax* with a large fovea on each side in front,

each opening out to the front angle, but the two separated by a wide ridge, the ridge with two short, wide horns overhanging it, behind these a rather large fovea, a rather short subconical tubercle towards each side in line with the median ones; sublateral foveae irregular; sides with dense punctures, with small punctures and with rather large and fairly deep ones irregularly scattered about. *Scutellum* with small punctures. *Elytra* striate-punctate, thirteenth and fourteenth rows close together towards base, but not conjoined. Front *tibiae* with five teeth, hind ones with two transverse carinae, between the subapical one and the base a row of small tubercles on each side. Length, 16-18 mm.

♀. *Head* with two small tubercles on frontal elevation, carinae of clypeus strong, the frontal margin raised into an obtuse tubercle above each antenna. *Prothorax* with two small shallow marginal foveae at apex, the space immediately behind a line connecting same, smooth, almost vertical, and crowned by a somewhat curved carina, the larger punctures more numerous than on male, continued across the middle, and the middle ones connected by irregular rows with the marginal foveae.

Hab.—North-western Australia: Fortescue River (W. D. Dodd). Type, I. 3700. Marble Bar (Western Australian Museum). Co-type, 1914—831; South Australia (National Museum).

Allied to *armigerum*, but male with median horn of head semi-double, the median ones of prothorax also semi-double, closer together, with a deep fovea behind them, and a deep one on each side in front; the female, in general appearance, is close to the female of *tenax*, with which it would be associated in Blackburn's table, but differs in having the outer edge of each canthus on a level with the upper edge of the eye, not below it; there are also other slight differences. The elevated parts of the head and the tibial teeth are black. The prothorax is entirely without small foveae on the front margin; the two frontal foveae of the male are large, but so placed that when the prothorax is viewed from slightly behind they are quite invisible, each is of a size almost to contain the head if the canthi and tubercles were removed from same; the median fovea is much smaller although very conspicuous.

Bolboceras hoplocephalum, n. sp.

Pl. xxxiii., figs. 57 to 59.

♂. Dark castaneous. Under-surface densely clothed.

Head with two very conspicuous horns at base, concave between same, and a subtriangular ridge between antennae,

the ridge crowned with two subtriangular tubercles; front face of clypeus subvertical, with crowded and fairly large punctures, elsewhere sparsely or not at all punctate; canthi rather deeply concave; outlines of mandibles somewhat sinuous. *Prothorax* obliquely irregularly flattened and highly polished on apical half, at summit of slope with four remnants of a transverse ridge; with round distinct punctures irregularly scattered about, but towards the sides becoming subobsolete. *Scutellum* impunctate. *Elytra* conspicuously striated, with rather feeble punctures in the striae, thirteenth and fourteenth irregularly conjoined towards the base. Front *tibiae* with five teeth, hind ones with two transverse carinae. Length, 14-16 mm.

♀. *Head* with frons concave and frontal elevation absent, clypeal elevation with three notches, lateral areae much smaller than usual. *Prothorax* along middle almost evenly rounded from base to apex, except for a carina traversing the apical fourth, in front of same to head impunctate, except at the margin; punctures larger and more numerous than on male.

Hab.—Western Australia: Beverley (F. H. du Boulay). Type, I. 221.

The male differs from the male of *taurus* in having the horns between the eyes much longer than the ones in front, instead of much shorter, the front ones are also conjoined instead of widely separated, the apex of the prothorax is also not bifoveate. The horns at the base vary in length and direction, on some specimens, except for a slight curvature, they are almost erect, so that the space between their tips is about the same as that between their outer bases; on other specimens, however, they diverge so much that their tips are twice as distant as their outer bases. The sublateral foveae of the prothorax, although not very deep, are laterally extended, and are bounded in front and behind by distinct ridges. Blackburn considered the junctioning or otherwise of the thirteenth and fourteenth elytral striae near the base to be of specific importance, but on several specimens of this species they are irregularly conjoined on one side and free (although close together) on the other.

Bolboceras contextum, n. sp.

Pl. xxxiii., figs. 54 and 55.

♂. Castaneous, some projecting parts black. In parts densely pilose.

Head irregularly excavated and with scattered punctures: a transverse ridge between eyes, ending near each eye in an acute conical tubercle, each tubercle with a thin longitudinal ridge extending backwards to the base and frontwards to the

inner front corner of the ocular canthus; the latter with front edge gently incurved and outer front angle lightly rounded off; clypeal elevation in the form of an acute undulating ridge, with its sides tuberculate; front face of clypeus (middle area) almost vertical, asperate-punctate; left mandible evenly rounded and then obliquely truncate to apex. *Prothorax* with sides strongly rounded and finely (almost evenly) serrated; with irregularly distributed punctures, varying from sparse and minute to coarse and crowded, more crowded on the sides and larger across middle than elsewhere; with two subtriangular tubercles slightly nearer apex than base and almost directly posterior to the subocular tubercles, the two connected by a curved carina; with a rather deep and fairly large excavation from apex (where it is deepest) to just outside of each of the submedian tubercles; sublateral foveae rather large and irregular. *Elytra* rather lightly striate-punctate. Front *tibiae* with five teeth, hind tibiae bicarinate. Length, 12-13 mm.

♀. Differs in having the head more densely punctate, the ridge between the eyes more obtuse and not ending in tubercles, clypeal elevation slightly higher in the middle than at sides, front face of clypeus with larger and more regular punctures, frontal excavations of prothorax reduced to shallow depressions and the discal tubercles absent, but with the connecting ridge distinct and bisinuate.

Hab.—Northern Territory: Daly River (H. Wesselman). Type, I. 5768.

Belongs to the first subgroup of Blackburn's second group of the genus, although the male has two foveae close to the front margin of the pronotum (inconspicuous on the female, however), and in his table would be associated with *taurus*, from which the male differs in having the cephalic elevations much smaller, those in front closer together, the prothorax with two small processes, and the frontal excavations much smaller and shallower; the female differs from the female of *taurus* in having the transverse elevation between the eyes not tuberculate, the clypeal elevation different, and the pronotum with a semi-double median transverse ridge, and with very different punctures. In some respects it approaches some small females of *frontale* and *hoplocephalum*, but the elytral striation is less profound and the clypeal elevation is very different; the male, however, is very different to the males of those species.

BOLBOCERAS PENTAGONICUM, n. sp.

Pl. xxxiii., figs. 56 and 60.

Flavo-castaneous, tips of some projecting parts black or blackish. In places densely pilose.

Head with dense and small asperate granules; with a short longitudinal hairy elevation inwards of each eye; ocular canthi acute at outer apex; clypeal elevation with a distinct subconical elevation on each side and a slightly larger one in middle, immediately behind the middle one two slightly smaller ones; middle area of clypeus with its dividing line distinct in middle, but obliterated towards sides; mandibles very prominent, each deeply and conspicuously notched at about one-third from apex. *Prothorax* with sides strongly rounded and very feebly serrated; surface irregularly granulate and punctate; at about basal third with an obtuse carina parallel with hind margin, but terminated before the irregular sublateral foveae, behind it (except in middle) a shallow depression; in front of carina a depression bounded in front by a feeble ridge, tipped by two small tubercles not quite touching each other, between tubercles and apex a fairly large excavation. *Elytra* striate-punctate, both punctures and striae more or less obliterated posteriorly. Front *tibiae* with six teeth, hind tibiae bicarinate. Length, 23 mm.

Hab.—Western Australia: Perth (F. H. du Boulay). Type (unique) in National Museum.

This and the two following species belong to the second subgroup of Blackburn's second group, a subgroup whose species have females quite as distinctive as their males, but (apart from dissection) I am unaware as to how the sex of a unique specimen may be determined, and I do not know the sex or sexes of these species. The five tubercles (three of which are close together) between the antennae and the short hairy ridges near the eyes readily distinguish the present species from any other known to me. The tubercles on the pronotum are smaller than those on the head, the mediofrontal excavation is slightly larger than an antennal club, its middle is longitudinally impressed, and the impression can be traced backwards between the small tubercles to near the subbasal carina; there are no round, sharply-defined punctures on the prothorax, the surface being mostly asperate-granulate and in places almost vermiculate.

Bolboceras dacoderum, n. sp.

Pl. xxxiii., fig. 51.

Castaneous, some projecting parts black. In places densely pilose.

Head rather widely flattened and with small punctures between eyes; clypeal elevation with three rather small subconical elevations of even height, but the middle one somewhat larger than the others; middle area of clypeus appearing as an almost vertical rugose front face; mandibles strongly

rectangularly notched at one-third from apex. *Prothorax* rather strongly emarginate in front, sides strongly rounded and very feebly serrated; with rather dense and moderately large, irregularly-distributed punctures, interspersed with numerous small ones, but along median third with small ones only; towards base with a feeble transverse carina, nearest (but not touching) the base in middle, and vanishing far from the sides; with two rather small, porrect, conical, subcontiguous tubercles in middle, slightly nearer base than apex, the space between them and subbasal carina gently depressed, between them and apex largely excavated; sublateral foveae moderately large. *Elytra* rather strongly punctate-striate, interstices with small punctures and in places finely rugose. Front *tibiae* with six teeth, hind tibiae bicarinate. Length, 14 mm.

Hab.—Western Australia. Type (unique) in National Museum, from C. French.

Nearer to *chelyum* than to any other species known to me, but the two median processes of pronotum closer together, the transverse carina less conspicuous, at its middle nearest to the base (instead of most distant from it there), cephalic elevations very different, and mandibles rectangularly notched.

BOLBOCERAS TRYMODERUM, n. sp.

Dark castaneous, elytra almost black, some projecting parts of head and legs black. In places densely pilose.

Head gently dilated near eyes and feebly depressed in middle; with rather small, irregularly-distributed punctures; ocular canthi acutely angular at outer apex; clypeal elevation lightly tuberculate on each side, in middle elevated into a conspicuous semi-double process, oblique on its posterior face, almost vertical on its lateral and front faces; margining lines of clypeal areas in places obliterated; mandibles rather lightly notched towards apex. *Prothorax* rather deeply emarginate in front, sides strongly rounded and lightly but unevenly serrated; with moderately large irregularly-distributed punctures, and some very small ones; with a conspicuous median carina terminating near each side slightly in advance of the sublateral fovea, its middle slightly nearer base than apex; in front of carina almost vertical, and with transverse, semi-double ridges, each about the width of the scutellum, and separated slightly more than same; in front of the space between them with a deep round fovea, a moderately distinct fovea on each side of middle of front margin. *Elytra* strongly striate-punctate, both striae and punctures becoming less defined posteriorly. Front *tibiae* with six teeth, hind tibiae bicarinate. Length, 13 mm.

Hab.—Western Australia: Lawlers (W. du Boulay). Type (unique) in National Museum.

In general appearance fairly close to *interruptum*, but prothorax without a medio-apical projection, each projection in front of the subbasal carina semi-double, and not with the appearance as of parts of an interrupted carina, and the elevations on the head very different. The semi-double tubercle on the head is slightly longer than the second tooth on the front tibiae.

Liparochrus dilatatifrons, Blackb.

L. timidus, Arrow.

A specimen of *dilatatifrons* was sent to Mr. Arrow for his opinion, and in reply he wrote that it was identical with *timidus;* the former name has priority.

Pararhopaea.

In his table of the "True *Melolonthides*" (*ante*, 1911, pp. 187, 188) Blackburn distinguished this genus by "Labrum strongly directed forward, almost horizontal," as against "Labrum vertical or nearly so" of *Rhopaea* and *Pseudoholophylla*. The type of the only previously described species of *Pararhopaea (callabonnensis)* is in the Museum, and its labrum appears to be quite vertical to the long axis of the body; in fact, it appears exactly on the same plane as the basal portion of the clypeus, and almost at right angles to the front elevation of that organ. In *Rhopaea* it is directed at right angles to a straight line continuing the base of the clypeus, and gently diverges from a line continuing its front elevation.

Pararhopaea gigas, n. sp.

♂. Bright castaneous, some narrow margining parts black or blackish. Densely clothed with long yellowish hair on sterna, parts of legs, junction of prothorax and elytra, hind margin of scutellum, and basal joint of antennae; upper-surface with very short, sparse, depressed, whitish setae.

Head with two feeble elevations between eyes; the punctures there dense, large, shallow, and reticulate, about base much smaller and sparser; clypeus with elevation high and bilobed, in middle of apex much less elevated than at sides; labrum widely and deeply notched, with numerous setiferous punctures. Antennae with first joint large and obtriangular, second small, third-tenth forming a curved flabellate club. Apical joint of palpi with a wide, shallow depression. *Prothorax* about twice as wide as long (14 × 7½ mm.), sides crenulate and subangularly dilated near the

middle: with large shallow punctures, dense in front, irregularly distributed elsewhere; with a feeble and irregular median line. *Scutellum* with irregular punctures, hind margin rugose. *Elytra* three-fourths as wide as long (18 × 24 mm.), shoulders rounded, sides gently dilated to beyond the middle; with irregularly distributed and rather small punctures, some round and others transversely rugose; disc of each elytron with three extremely feeble costae, the third commencing in a shallow post-humeral depression. *Pygidium* acutely margined, tip obtusely bilobed, with numerous small punctures and in parts shagreened. *Legs* long; front tibiae acutely tridentate, hind tibiae with two unequal spurs, the inner one moderately acute and about as long as basal joint of tarsi, the outer one longer and wider, dilated from base to beyond the middle, and then feebly rounded to apex; claw-joint with a short bisetose onychium; claws long, with a strong acute tooth about middle and a rounded swelling at base. Length (♂, ♀), 34-39 mm.

♀. Differs in having prothorax smaller and narrower, elytra more dilated, abdomen considerably larger, pygidium more convex and much less acutely margined, club much smaller, legs shorter, spurs to hind tibiae wider and shorter, and hind tarsi considerably shorter.

Hab.—Western parts of South Australia: Ouldea (R. T. Maurice), Lake Arcoona (A. Loveday), Overland Railway, ten miles east of Golden Well (— Chandler, in National Museum). Type, I. 517.

The largest specimen in actual bulk is exceeded only by an unusually large specimen of *Lepidiota froggatti*, of all the Australian *Melolonthides* in the Museum, but its length is slightly less than that of *Lepidoderma waterhousei*. The club is composed of eight joints, instead of seven, as in *callabonnensis* and the following species, but in the allied genus, *Rhopaea*, the joints of the club vary in number from five to eight. On the male the first lamella of the club is about as long as the clypeus is wide, and is truncate at its tip, the second is rather abruptly bent backwards from where it passes the first and (as also the succeeding joints) is about one-third longer than it. On the female the lamellae of the club are only about the length of the basal tarsal joint, the first lamella is about two-thirds the length of the others, slightly longer than the joint itself, and acutely pointed. On the apical joint of the only female in the Museum there is a small swelling that from some directions causes the club to appear nine-jointed, but this is probably accidental. On the specimen in the National Museum there are a few long hairs near each front angle of the pronotum.

PARARHOPAEA RHIPIDOCERA, n. sp.

♂. More or less castaneous, some marginal parts narrowly black or blackish. Densely clothed with long yellowish hair on sterna and parts of legs, basal joint of antennae, latero-frontal and hind margins of prothorax, and hind margin of scutellum.

Head coarsely sculptured between eyes; clypeus with large, round, shallow punctures, its margining elevation high and very feebly bilobed; labrum moderately notched, with a few coarse punctures at sides. Antennae with first joint moderately large, second short, third slightly longer and wider, with a short projection near the inner apex, fourth-tenth forming a strongly-curved flabellate club. Apical joint of palpi with a long excavation. *Prothorax* strongly transverse, sides moderately rounded with the margins crenulated, apex incurved to middle; with moderately large, shallow punctures, dense in front, irregular elsewhere; with feeble remnants of a median line and with a shallow depression towards each side. *Elytra* not much wider than prothorax, sides almost parallel to near apex; with moderately coarse punctures, in places subvermiculate, and denser towards apex and sides than elsewhere; disc of each elytron with four costae, the inner ones more conspicuous than the outer ones. *Pygidium* with rather acute margins, tip feebly notched; with moderately dense punctures. *Legs* rather long; front tibiae strongly tridentate, hind tibiae with two unequal spurs, but the longer one not much wider than the shorter one; onychium small, but with two long setae, each claw with an acute tooth. Length, 18-24 mm.

Hab.—Western Australia: Mullewa (Miss J. F. May). Type, I. 4523.

Of the size and general appearance of *callabonnensis*, but head very different between eyes, prothorax longer, with different punctures, and without long discal hairs. The smaller specimens are rather more coarsely sculptured than the larger ones. The head between the eyes on most of the specimens appears irregularly biareolate, with the punctures crowded and coarse, on two of them the coarsely-punctured space appears instead to be elliptic in outline. The lamellae of the club are subequal in length and slightly longer than the four basal joints of the tarsi; they are usually closely folded together, but when separated have a beautiful fan-like appearance. The hairs at the apex of the scutellum are not on its upper-surface, and on several specimens are concealed (or abraded).

LEPIDIOTA PICTICOLLIS, n. sp.

Bright castaneous; head, all margins, and a median line on prothorax, scutellum, under-surface, pygidium, and legs black or blackish; antennae (club castaneous), palpi, and claws obscurely diluted with red. Clothed with seta-like white depressed scales, dense on head, all margins of prothorax, scutellum, and sides of abdomen, and not very dense elsewhere; sterna and base of abdomen with long, dense, whitish pubescence, and with some straggling hairs; legs with long hairs and white seta-like scales.

Head with crowded and moderately large punctures; clypeus conspicuously bilobed, with larger and sparser punctures than on the rest of head. Antennae with first joint almost as long as four following combined, second rather short and stout, third and fourth moderately long and subcylindrical, fifth of irregular shape, sixth and seventh very short and strongly transverse; club three-jointed, the lamellae nearly as long as the six preceding joints combined. *Prothorax* strongly transverse, sides finely margined and feebly crenulated, front without raised margin; with small and not very dense punctures, becoming crowded at sides and in front, with a shallow medio-frontal impression. *Scutellum* with rather dense punctures. *Elytra* at base very little wider than prothorax, sides feebly dilated to near apex; surface lightly rugose, and with small and not dense punctures; each elytron with four discal costae, the two inner ones moderately distinct and conjoined to form a small swelling at summit of apical slope, the two outer ones very feeble, with the fourth quite close to the margin. *Pygidium* rather acutely margined, with a vague median line, tip lightly notched; punctures crowded and rather small. *Legs* rather long; front tibiae strongly tridentate, middle tooth nearer the apical than the subbasal one; tarsi slightly longer than tibiae; claws each with a long and acute median tooth, and a small subtriangular basal one. Length, 36-38 mm.

Hab.—Northern Queensland: (H. J. Carter's No. 6), Stradbroke Island (H. Hacker, Queensland Museum's No. 307). Type, I. 4525.

In general appearance not at all close to any of the species named or identified by the late Rev. T. Blackburn, and at first glance apparently nearer to *Pararhopaea* and *Paralepidiota* than to *Lepidiota*, but the antennal club is rather small and composed of but three joints, hence in his table of the true *Melolonthides* it could only be referred to *Neolepidiota* or to *Lepidiota* (unless to a new genus). Referring it to *Lepidiota*, in his table of that genus it would

be referred to A, BB, but from the four species there associated (as, in fact, from all others of the genus) it may be readily distinguished by the bicoloured pronotum: on this the black (or, at least, very dark-brown) markings are so disposed that the castaneous parts form two large irregularly-rounded patches. In some lights some of the hairs on the front femora have a beautiful golden-rose gloss. The front tarsi are of the same proportionate length as those of *froggatti*.

The specimen from Mr. Carter (labelled by the late Rev. T. Blackburn "Not known to me") is considerably paler than the others, with the pygidium obscurely reddish; it is also much less densely clothed (but this is probably due to abrasion).

LEPIDIOTA DARWINI, Blackb.

The type of this species was a female, but both sexes were described by Blackburn. There are now before me nine females, two of which were compared and agreed with the type, and another is marked as a co-type. On all of them the propygidium and abdomen are very densely clothed with scales that are (either now or evidently once were) of a snowy whiteness; on three of them the pygidium is moderately clothed, but the scales are sparser and larger than on the adjacent parts; on the others, however, the pygidium is almost or entirely glabrous, and appears conspicuously black, in striking contrast to the snowy scales near it; it appears to be a trifle longer than wide, but by actual measurement is seen to be a trifle wider than long.

There are also six males before me, two bearing Blackburn's name labels and two others his number 2789 (in a note-book recorded as *darwini*). At first glance these specimens look strikingly different to the females, and I am by no means satisfied that their identity is certain. They differ in being smaller, paler (the colour gradually becoming still paler posteriorly), prothorax more convex, with larger and sparser punctures, without a shining median line (this being distinct on all the females); elytra less regularly clothed and with three or four fairly well-defined (although not conspicuously elevated) glabrous lines on each (of these, on the females there are scarcely any traces, or none at all, although the type was said to "bear obscure indications of three or four wide, scarcely-convex costae"). The pygidium is more transverse than in the female (regularly clothed on all six), the abdomen is smaller, and the elytra are less dilated posteriorly, but these latter characters are certainly sexual.

LEPIDIOTA PERKINSI, Blackb.

Four co-types of this species are slightly smaller and the prothoracic punctures are smaller in proportion than on the males noted under *darwini*, but at most they represent a slight variety of the same. If the males so noted are really males of *darwini*, then *perkinsi* must rank as a variety only of that species.

LEPIDIOTA DELICATULA, Blackb.

L. suavior, Blackb.

In the late Rev. T. Blackburn's collection there was no label representing *delicatula*, as there nearly always was when an unique specimen had been removed from his collection; in consequence he appears to have entirely overlooked the species when tabulating the genus.[3] The type is in the South Australian Museum, and was compared and agreed with the type (now in the British Museum) of *suavior*.

LIPIDIOTA SQUAMULATA, Waterh.

In commenting on the scales of this species (under the description of *leai*) Blackburn laid stress on the colour of the same. There are before me two specimens from his collection labelled as *squamulata*, two sent by Mr. Arrow as having been compared with the type, and some others. The species appears to be fairly common in North-western Australia. Some of the specimens have all the scales of a snowy or slightly waxen whiteness (probably the natural colour of living specimens), on others they are all more or less brownish, and on still others they vary from white to brown, but this is almost certainly due to discoloration by age, immersion in liquids, etc.

DIPHUCEPHALA.

In Blackburn's table of this genus (*ante*, 1906, pp. 268-272), in A, E, and EE, there are mistakes; evidently *ignota* was misplaced, and the word "elytra" was used instead of "prothorax"; the lines in question should have been:—

E. Lateral margins of prothorax strongly dentate in the middle ... ... *ignota*. Macl.

EE. Lateral margins of prothorax at most feebly angular in the middle.

the line EE governing only *nitens* and *rufipes*, and not *ignota*.

For K (*aurolimbata*) the character of the clothing of the pygidium used is confined to the female, the depression behind the scutellum is extremely feeble, and practically useless; the species, however, is a very distinct one.

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[3] *Ante*, 1912, p. 63.

For LL *(smaragdula)* "rygidium" was evidently a mistake for "scutellum"; the species in his collection doubtfully identified as *smaragdula* has the scutellum non-foveate, but pygidium much as on *pulchella* (on p. 268 Burmeister was given as the author instead of Boisduval).

DIPHUCEPHALA PULCHELLA, Waterh.

D. azureipennis, Macl.

This species varies in length from 6 to 8 mm., and has an almost parallel range of variation in colour to that of *colaspidoides*, from which species it may be readily distinguished by the much wider and less parallel-sided median groove of the prothorax. From examination of the type of *azureipennis* Blackburn considered that name to be synonymous, and such was my own impression from a similar examination.

DIPHUCEPHALA NITIDICOLLIS, Macl.

D. obscura, Macl.

This synonymy has been already noted by Blackburn, and when I examined the specimens standing under the name of *obscura* in the Macleay Museum they appeared to be simply dirty ones of *nitidicollis*.

DIPHUCEPHALA MINIMA, Macl.

The only specimen in the Museum that could be placed in BBB, of Blackburn's table, is a small female that agrees well with Macleay's description of *minima*, except that the front tibiae are bidentate (but the second tooth is very small) and that the colour is purplish-blue instead of green (a common variation in colour).

DIPHUCEPHALA HIRTIPENNIS, Macl.

DIPHUCEPHALA COERULEA, Macl.

DIPHUCEPHALA LATIPENNIS, Macl.

The types of these species were returned to the Queensland Museum by Macleay, and have perished.

DIPHUCEPHALA HIRTIPES, n. sp.

♂. Bright metallic-green, densely clothed parts more or less coppery; club of antennae, flanks of prosternum, hind tibiae (except at base), hind tarsi, and parts of the others, black or blackish; rest of the legs and of the antennae reddish. Head, pronotum (except a large medio-basal subquadrate space), flanks of sterna and hind coxae with dense depressed scales, more or less stramineous in colour, abdomen

with paler scales, but along middle with long stramineous hairs, becoming almost tufted at tip; pygidium densely squamose, metasternum with rather long pubescence or short hairs; legs with stramineous hairs, becoming much longer, blackish, and very conspicuous on the hind tibiae and tarsi.

Head with densely crowded punctures; clypeus with two conspicuous sutures, the space between about twice as wide as long, tips semi-upright, somewhat rounded, the notch semi-circular. *Prothorax* about as long as wide, sides lightly increasing in width from base to middle and then strongly diminishing to apex, which is about half the width of base; with a very feeble median line; punctures very dense, but more or less concealed, except on the glabrous portion, where they are very shallow, with a confluently-variolose appearance. *Scutellum* highly polished and impunctate. *Elytra* finely shagreened throughout, with irregular rows of small punctures. Front *tibiae* bidentate; three basal joints of front tarsi densely clothed on lower surface. Length, 9 mm.

Hab.—Queensland: Cairns district (F. P. Dodd). Type, I. 5759.

In general appearance strikingly close to *sericea*, with which it would be associated in Blackburn's table, but apical half and sides of pronotum densely squamose and the rest glabrous, elytra glabrous and with much smaller punctures, and abdomen with very different clothing (the hairy part of the abdomen is completely free from scales). The ocular canthi have longer and stiffer clothing than usual; there is a feeble ridge along the middle of the pygidium.

DIPHUCEPHALA TARSALIS, n. sp.

♂. Bright metallic golden-green, antennae (club black) and legs (claws blackish) reddish. Moderately densely clothed with rather long, subdepressed, stramineous setae, becoming denser and paler on under-surface and pygidium, but the latter glabrous at apex.

Head flat and with crowded punctures between eyes; clypeus with tips elevated and obtusely triangular, the dividing notch very wide. *Prothorax* lightly transverse, sides lightly incurved between middle (where each is acutely angular) and base, with a rather deep median groove somewhat dilated at base, lateral sulci well defined but not traceable to middle, with rather large punctures (more crowded in the depressions than elsewhere), each with a single setiferous granule. *Scutellum* highly polished and impunctate. *Elytra* distinctly wider than prothorax; with large, deep, approximate punctures in irregular rows; fourth and

seventh interstices lightly elevated. *Pygidium* rather coarsely shagreened. Front *tibiae* acutely bidentate; front tarsi densely padded on under-surface, first joint somewhat triangular, second (excluding its supporting base) fully four times as wide as long, third somewhat smaller but of the same proportionate width, fourth irregularly triangular. Length, 6-6½ mm.

♀. Differs in having the tips of the clypeus much smaller and but feebly elevated, legs shorter, with front tarsi much narrower and not spongiose, and by the more convex abdomen.

Hab.—Queensland: Mount Tambourine (A. M. Lea); New South Wales: Comboyne (W. H. Muldoon). Type, I. 4487.

In Blackburn's table would be associated with *nitidicollis*, from which it differs in being considerably smaller, and by the remarkably wide front tarsi of the male; from small specimens of *rufipes* it differs in the very different clothing of upper-surface and different shapes of the inflated front tarsal joints of the male; in size it is about equal to *puberula*, but the sculpture and clothing are very different. The tips of the clypeus are obscurely diluted with red.

DIPHUCEPHALA PYGIDIALIS, n. sp.

♂. Bright metallic-green or coppery-green, two or three basal joints of antennae reddish, the others black, under-surface of clypeal tips black and shining, tarsi blue or purple, the claws black, tips of front tibiae reddish. With white, moderately-long setae or elongate scales, fairly dense on head (denser on tips of clypeus than elsewhere), moderately dense on sides, base, and along middle of pronotum (and a few scattered about elsewhere), and forming feeble lines on elytra; under-surface and legs with moderately-long white hair, forming a tuft on pygidium and becoming black on parts of tarsi.

Head shagreened and with crowded, partially concealed punctures; clypeus distinctly and evenly narrowed from base, the tips acutely elevated and subtriangular, their dividing notch almost U-shaped. *Prothorax* moderately transverse, but much longer than the apical width, which is about half that of the base, base bisinuate, but truncate at scutellum, sides rather strongly rounded, front angles rounded off, median line (except for its clothing) vaguely defined, lateral impressions rather small deep foveae; finely shagreened throughout and with small dense punctures at sides. *Scutellum* depressed in middle, shining, and very feebly shagreened. *Elytra* somewhat dilated in middle, a feeble

depression near base; with somewhat irregular rows of not very large punctures, shagreened throughout. *Pygidium* shagreened and with a vague median line. Front *tibiae* with an acute apical tooth only, three basal joints of front tarsi inflated and (as also the fourth) with dense white setae on under-surface. Length, 8-10½ mm.

♀. Differs in having the head smaller, sides of clypeus more strongly rounded, the projecting tips much smaller, abdomen more convex, legs shorter, with the front tarsi not dilated and not spongiose.

Hab.—Western Australia: (old collection), Cunderdin (Western Australian Museum), Mullewa (Miss J. F. May). Type, I. 5757.

In Blackburn's table would be associated with *furcata*, from which (as from all other Western Australian species) it is distinguished by the conspicuously narrowed clypeus of the male, and finely shagreened and curiously clothed pronotum. The male of *mastersi* has the sides of the clypeus more rounded, the prothorax with large shallow punctures on the sides, and the pygidium not tufted, with the clothing elsewhere different. On two of the specimens the pronotum is more conspicuously coppery than the other parts. The long white scales on the elytra of specimens in perfect condition form a row on each interstice, but a very slight amount of abrasion causes them to appear irregularly distributed, they give the elytra (to the naked eye) a curiously speckled appearance; on all the specimens the base of the prothorax is margined with scales: on two males the scales form three conspicuous longitudinal lines and two feeble ones, with a few scattered about irregularly; on another male they are irregular, but on the only female before me the longitudinally disposed scales are confined to a conspicuous median line and the margins (on the latter they are mixed with numerous long hairs), the disc between being quite glabrous. The pygidium is glabrous on the upper portion and sides, but with dense hairs at the tip, and these, mingling with those at the tip of the abdomen, give it a tufted appearance: it is without trace of a foveate impression in either sex.

Diphucephala insularis, n. sp.

♂. Bright metallic-green, or coppery-green, tarsi blue or purple, antennae, palpi, and under-surface of tips of clypeus black. Moderately clothed with stramineous depressed setae, on the elytra having a somewhat lineate appearance; denser and paler on the under-surface and pygidium, but the latter glabrous at tip.

Head shagreened, and with crowded, large, shallow punctures; clypeus with tips largely produced, rounded on their inner and almost straight on their outer sides, the dividing notch wide. *Prothorax* moderately transverse, base not much wider than apex, front angles acute, sides acutely angulate in middle, with a wide, simple, and rather shallow basal depression, suddenly narrowed towards apex, lateral depressions deep and vaguely traceable to median one; with rather dense, large, shallow, shagreened punctures, denser in depressions than elsewhere. *Scutellum* polished at base, shagreened elsewhere. *Elytra* shagreened throughout, and with more or less regular rows of moderately large punctures. Front *tibiae* with a rather light subapical tooth in addition to the apical one; front tarsi spongiose. Length, 5½-6 mm.

♀. Differs in having the clypeus more conspicuously divided into two parts by a transverse carina, the front part more polished, the tips shorter and much less elevated, abdomen more evenly convex, and legs shorter, with front tarsi thinner and not spongiose.

Hab.—Queensland: Stradbroke Island (Dr. A. Jefferis Turner, H. Hacker, and Queensland Museum's No. 313). Type, I. 4494.

In some respects close to the description of *rectipennis*, but smaller and sides of elytra no straighter than in *pulchella;* but Blackburn would probably have associated it with *spencei* in his table; from the species so identified by him it differs in being smaller, elytra finely shagreened as well as punctured, lateral armature of prothorax more conspicuous, and front tibiae with dentition less conspicuously (or not at all) reddish. Its size is about equal to that of *pygmaea*, but the medio-basal depression of the pronotum is not semi-double. The colour of the upper-surface of the individual is almost uniform (although the pronotum, owing to its punctures, has a slightly different shade to the naked eye), but nine (four males and five females) of the specimens are coppery-green and five (all males) are more or less bluish-green. The tip of the pygidium is shining in both sexes.

A female from New South Wales (Dorrigo, W. Heron), that appears to belong to the species, has the head and prothorax more conspicuously green than the elytra and other parts.

Cunderdinia, n. g.

Clypeus with side and front margins conspicuously elevated, the latter very feebly incurved to middle. Antennae composed of nine joints (three forming a club). Claws large,

each with a strong acute tooth commencing before the middle. Other characters much as in *Diphucephala*.

The only species known at first glance appears to be quite an ordinary *Diphucephala*, but the extra joint to the antennae and the very different claws and clypeus forbid its being referred to that genus.

CUNDERDINIA VARIABILIS, n. sp.

♂. Bright metallic-green, tibiae and tarsi purple, antennae black, two basal joints reddish, two apical joints of palpi black. Under-surface with dense white scales in places, and with long straggling white hair, the legs also with white hair, and the pygidium with hair and scales, a few white setae about apical parts of elytra, and moderately dense on clypeus, some straggling hairs at sides of prothorax.

Head with densely crowded punctures, becoming still more crowded on clypeus; clypeus about once and one half as wide as long, its suture with head straight, sides feebly rounded and increasing in height to apex, which is very feebly bilobed. Eyes with a small medio-frontal canthus. Antennae short, first joint moderately long, second subglobular, third and fourth each about the length of second, but much thinner, fifth transverse and of irregular shape, sixth smaller and still more transverse, lamellae of the club slightly shorter than the eye. *Prothorax* at base slightly wider than the median length, much wider than at apex, and very feebly bisinuate, front angles acute and produced, hind angles acute, each side at middle acutely produced, and inwards of produced part with a foveate impression, a feeble median line on basal half; with dense, round, sharply-defined punctures of moderate size, becoming smaller and more crowded on sides. *Scutellum* rather large, semicircular, convex, but with apex flat and narrowly margined; impunctate but feebly rugose. *Elytra* very little wider than prothorax, sides very feebly increasing in width to apex, where each is widely separately rounded; with crowded punctures of moderate or fairly large size, and many transversely confluent. *Pygidium* obtusely triangular and slightly longer than wide. *Legs* long; front tibiae with a feeble outer tooth near the apex, but the apical tooth long, curved, and acute; tarsi longer than tibiae, front ones with four basal joints densely padded with whitish setae on lower-surface, two basal joints rather wide, third narrower, fourth as long as third but narrower, fifth (with claws) almost as long as the rest combined. Length. 7½-8 mm.

♀. Differs in having the clypeus slightly less elevated in front, abdomen more convex, legs shorter, with the front tarsi not spongiose on the lower-surface.

Hab.—Western Australia: Cunderdin. Type, 8233 in Western Australian Museum; co-type, I. 5758, in South Australian Museum.

The colour as described for the type applies also to three other males, except that on one of them the head is somewhat purplish: one female is coppery-green, another is purplish-blue, and another male is purple; the two latter specimens in some lights appear to be of exactly the same shade of colour. There is a small point with two long setae between the claws, representing an onychium, but it is much less conspicuous than on *Diphucephala*.

PHYLLOTOCIDIUM PICTUM, n. sp.

Pl. xxxii., fig. 2.

♂. Head (labrum black), prothorax (margins narrowly flavous), and scutellum dark metallic-green, elytra flavous, suture, margins, base (narrowly), and apex purplish, under-surface and pygidium black, with a purplish gloss; antennae, palpi, and legs (tibiae more or less green) flavous. Under-surface and legs with rather long white or whitish hairs, a few similar hairs on sides of prothorax and of elytra.

Head with rather dense, well-defined punctures, flat between eyes; clypeus convex in middle, suture well defined, punctures smaller than on base of head; labrum about half the width of base of clypeus. *Prothorax* moderately transverse, all angles acute, sides somewhat dilated from apex to middle and gently incurved between same and base; punctures slightly larger and not quite so crowded as on head between eyes. *Scutellum* semicircularly triangular, punctures as on pronotum. *Elytra* no wider than prothorax at base, sides somewhat dilated to middle, apex truncate: with not very dense and irregularly-distributed punctures of small or moderate size; subsutural stria on each elytron distinct, the others rather feeble. *Pygidium* with punctures as on pronotum. Hind *coxae* as long as two basal segments of abdomen combined, hind femora stout, hind tarsi about as long as femora and tibiae combined, claws almost as long as their supporting joint; front tibiae acutely produced at apex, slightly longer than tarsi, middle tibiae slightly shorter than tarsi; four front tarsi each with two long white membranous appendages between the claws, these strongly curved and distinctly shorter than the hind ones. Length, 5-5¼ mm.

Hab.—Western Australia: Cunderdin (Western Australian Museum, No. 8232). Type, I. 5763.

The remarkable appendages to the four front tarsi (probably absent from the female) are evidence that this species

should be referred to *Phyllotocidium* rather than to *Phyllotocus*, but from the only previously described species of that genus it differs in many respects; the appendages are conspicuously longer than the claws they are placed between, and are slightly longer and distinctly wider than the hind claws. On the type the four hind tibiae (except at the base) are of the same shade of green as the pronotum, and the front pair have a slight metallic gloss, but on another specimen the front tibiae are more conspicuously green, and that colour is slightly extended to all the tarsi.

EUCNEMIDAE. (4)

The *Eucnemidae* are represented by a fair number of species in Australia, although not one appears to occur in abundance, and most are extremely rare, although often widely distributed. Whilst the species are usually very variable in size, and but few have strikingly distinctive colours, the genera are fairly easy of identification by characters of the under-surface, antennae, and legs.

Sixteen species are recorded in Masters' Catalogue, but several were overlooked. The following references are necessary to bring the Catalogue up to date:—

TABLE OF GENERA.—Blackb., Proc. Roy. Soc. Vic., 1899, pp. 216, 217.

DISCAPTOTHORAX, Blackb., *l.c.*, p. 219; KOEBELEI, Blackb., *l.c.*, p. 220.

DYSCHARACHTHIS, Blackb., *l.c.*, p. 217; BREVIPENNIS, Blackb., *l.c.*, p. 219; Trans. Roy. Soc. S.Aus., 1901, p. 131.

DYSCOLOCERUS, Bonv., Mon., p. 729; Blackb., Trans. Roy. Soc. S.Aus., 1892, p. 55; HEROS, Blackb., *l.c.*, p. 56; CONCOLOR, Blackb., Proc. Roy. Soc. Vic., 1899, p. 225; VICTORIENSIS, Blackb., *l.c.*, p. 226; BASALIS, Lea, Proc. Linn. Soc. N.S. Wales, 1894, p. 596; 1898, p. 555.

DROMOEOLUS INTERIORIS, Blackb., Proc. Linn. Soc. N.S. Wales, 1891, p. 502.

DYSTRIGONISTHIS, Blackb., Proc. Roy. Soc. Vic., 1899, p. 221; PARADOXUS, Blackb., *l.c.*, p. 222.

ENTOMOPHTHALMUS, Bonv., Mon., p. 513; UNIFORMIS, Blackb., Proc. Roy. Soc. Vic., 1899, p. 224.

EUMENES, Bonv., Mon., p. 744; BAKEWELLI, Bonv., *l.c.*, p. 745, pl. 36, fig. 2.

FORNAX PARVULUS, Bonv., Mon., p. 346, pl. 16, fig. 1; COLORATUS, Blackb., Trans. Roy. Soc. S.Aus., 1895, p. 219.

(4) *Melasinae*, Fleut.: Ann. Soc. Ent. Fr., 1901, p. 636.

GALBODEMA RUFICEPS, Bonv. In Masters' Catalogue (3044) in error as a distinct species, originally described as a variety of MANNERHEIMI, Cast.; Fleut., Ann. Mus. Civ. Gen., 1896, p. 587, records the variety from New Guinea, and it occurs also in Queensland and New South Wales.

HEMIOPSIDA, Macl. (*Lycaon*, Bon.), Lea, Proc. Linn. Soc. N.S. Wales, 1895, p. 230; NOVA, Bonv. (*mastersi*, Macl.), *l.c.*, p. 230; CONCOLOR, Lea, *l.c.*, p. 595; EXPULSA, Bonv., Blackb., *l.c.*, 1891, p. 503 [5]; NEOLYCAON, Blackb., Trans. Roy. Soc. S.Aus., 1900, p. 49; ATRA, Schwartz Deutsch. Ent. Zeit., 1902, p. 353.

HYPOCOELUS, Esch., Bonv., Mon., p. 694; AUSTRALIS, Fleut., Ann. Mus. Civ. Gen., 1896, p. 596.

MICRORHAGUS, Esch., Bonv., Mon., p. 524; SUTURALIS, Bonv., *l.c.*, p. 591, pl. 29, fig. 1; CAIRNSENSIS, Blackb., Proc. Roy. Soc. Vic., 1899, p. 222.

NEMATODES, Latr., Bonv., Mon., p. 644; MAJOR, Bonv., *l.c.*, p. 668, pl. 32, fig. 3; Fleut., Ann. Soc. Ent. Belge, 1897, p. 257; *Dromoeolus thoracicus*, Lea, Proc. Linn Soc. N.S. Wales, 1894, p. 595; Blackb., Proc. Roy. Soc. Vic., 1899, p. 219.

TRIGONOPLEURUS RUGULOSUS, Bonv., *Dromoeolus nigricollis*, Lea, Proc. Linn. Soc. N.S. Wales, 1894, p. 593; Blackb., Proc. Roy. Soc. Vic., 1899, p. 219.

MICRORHAGUS.

The species of this genus of world-wide distribution vary to an extraordinary degree in the antennae (see plates 26-29 of Bonvouloir's Monograph); but the genus may be distinguished from all others in Australia (except *Entomophthalmus*) by the presence of rather deep grooves resulting from the prosternal sutures being deepened, parallel-sided (except that they are somewhat dilated posteriorly), and parallel with each other, in consequence the propleural triangles are replaced by parallelograms. From *Entomophthalmus* it is distinguished by the antennae, these having the third joint long, whereas on that genus the third joint is quite remarkably short and usually closely applied to the fourth, so that the antennae at first appear to be but ten-jointed.

MICRORHAGUS CAIRNSENSIS, Blackb. [6]

On this species the grooves marking the prosternal sutures are unusually wide, but not as deep as in the other

[5] The specimen commented upon by Blackburn as probably belonging to this species has disappeared from his collection.

[6] By a printer's error originally printed *cairnesensis*.

species in the Museum, and the space outside of each groove is neither a parallelogram nor a triangle, as it is rounded in front, parallel-sided for some distance, and then strongly obliquely narrowed. In general appearance it is strikingly unlike any other in the Museum, and to associate it with them at first appears absurd. The antennae of the female are somewhat like those of figures 3 and 5, of plate 28, in Bonvouloir's monograph, but the male has an additional ramus.

MICRORHAGUS VARIEGATUS, n. sp.

Black or blackish, in places obscurely diluted with red, tibiae and tarsi reddish, antennae dull reddish-brown. Irregularly clothed.

Head with crowded punctures, distinct at base, partially concealed elsewhere. Antennae moderately long, second joint very short, third somewhat longer than fourth and fifth combined, fourth to tenth slightly produced on one side at apex, eleventh distinctly longer than tenth. *Prothorax* strongly transverse, front angles rounded, sides elsewhere parallel, hind angles acutely produced and strongly carinated, front margin carinated, and on each side with a short spur directed towards but not reaching the carina on the hind angle, with a strong median carina about base, but terminated before middle; with crowded but comparatively small punctures. *Elytra* parallel-sided almost to apex; with crowded and moderately large punctures about base, becoming smaller elsewhere, tips with a few granules. *Prosternal sulci* deep, narrow, about half the width of the propleural parallelograms; these slightly dilated about base and fully twice as long as wide. Length, $3\frac{1}{2}$ mm.

Hab.—New South Wales: Illawarra (Blackburn's Collection). Type (unique), I. 5724.

A moderately robust species with beautiful clothing. The obscurely variegated parts of the derm are the basal angles of prothorax, base and suture of elytra, and part of the muzzle. The clothing gives the upper-surface a conspicuously variegated appearance, as it is dense and golden in places, and sparser, shorter, and blackish in others; the golden pubescence is denser on the basal half of the prothorax than elsewhere, and in the middle is directed towards the basal carina, on the rest of the base it is directed backwards; on the apical half of each elytron the golden pubescence is conspicuous on the suture, apex, and side, the inner portion having more black pubescence than elsewhere; on the undersurface the pubescence is short and rather ashen. Each elytron has a postmedian sutural stria, but except for these striation is absent; the surface as viewed from the side

appears to be slightly undulating, but there are no conspicuous depressions.

Microrhagus serraticornis, n. sp.

Brownish-black, appendages of a dingy-red, tarsi paler. Moderately and almost uniformly clothed with short stramineous pubescence.

Head with crowded, partially-concealed punctures. Antennae not very long, second joint short, third dilated to apex, about as long as fourth and fifth combined, fourth lightly produced on one side at apex, fifth more strongly, sixth to tenth still more strongly produced (subpectinate), eleventh thin, longer than tenth. *Prothorax* transverse; with crowded asperate punctures; basal third with a narrow median carina. *Elytra* almost parallel-sided to near apex; base with crowded asperate punctures, but becoming smaller posteriorly; with vague remnants of striation, but becoming distinct on apical half near suture and on the tips. *Prosternal sulci* rather deep in front, becoming shallower and deeper behind, where the width is about equal to that of the propleural parallelograms, these about thrice as long as wide. Length, 3 mm.

Hab.—New South Wales: Tweed River (Blackburn's Collection). Type (unique), I. 5727.

A dingy species. The sides of the prothorax, basal angles, carinated front margin, and lateral spurs from same are almost exactly as in the preceding species.

Microrhagus ater, n. sp.

Deep-black, knees and tarsi reddish. Clothed with short, dark pubescence, becoming stramineous and somewhat longer at base of prothorax and of elytra, and on head.

Head with crowded, more or less concealed, punctures. Antennae much as in preceding species. *Prothorax* moderately transverse, parallel-sided, except for the rounded front angles, strongly convex, hind angles strongly produced and acutely carinated, with a short medio-basal carina, front margin finely carinated, and on each side with a short spur projecting backwards; with dense and small but not asperate punctures. *Elytra* with crowded asperate punctures on basal fourth and on tips, the intervening space with smaller but more clearly-defined ones; with feeble remnants of striation. *Prosternal sulci* rather deep, somewhat dilated posteriorly, where the width is about equal to that of the propleural parallelograms, these about thrice as long as wide. Length, $3\frac{3}{4}$ mm.

Hab.—Queensland: Cairns district (A. M. Lea). Type (unique), I. 5726.

A jet-black species, very close in general appearance to *howensis*, but legs partly darker, antennae much more conspicuously serrated, and head with paler clothing. To see the blackish pubescence clearly the insect must be viewed from the sides.

MICRORHAGUS TENUICORNIS, n. sp.

Black; base (including hind angles) of prothorax, scutellum, basal third (or fourth) of elytra, and the suture more or less conspicuously diluted with red, legs bright-red, antennae piceous-brown, two basal joints, or second only, somewhat paler. Moderately clothed with stramineous pubescence about base of prothorax and of elytra, elsewhere with black or ashen pubescence.

Head with a fine transverse subbasal carina; with very dense punctures, clearly defined behind carina, partially concealed in front of same. Antennae long and thin, very feebly serrated; second joint very short, third almost as long as fourth and fifth combined, eleventh distinctly longer than tenth. *Prothorax* strongly transverse, front angles rounded, sides slightly dilated at posterior angles, these strongly produced and acutely carinated, with a short medio-basal carina, continued as a depressed median line to apex, front margin with a fine carina, which on each side has a short spur projecting obliquely backwards; with crowded punctures of moderate size. *Elytra* lightly but regularly decreasing in width posteriorly; with crowded and rather coarse asperate punctures about base, becoming smaller posteriorly; with a distinct sutural stria beyond the middle on each elytron, elsewhere with but feeble remnants of striation. *Prosternal sulci* deep, narrow, and parallel-sided almost throughout; propleural parallelograms about thrice as long as wide. Length, $2\frac{1}{2}$-$3\frac{3}{4}$ mm.

Hab.—Queensland: Mount Tambourine (A. M. Lea). Type, I. 5728.

There are four specimens under examination and they differ but little, *inter se*, except in size.

The species known to me may be tabulated as follows:—

Antennae flabellate ... ... *cairnsensis*
Antennae not flabellate.
  Prothorax bright-red ... ... *ruficollis*
  Prothorax (base sometimes excepted) black or blackish.
    Third joint of antennae longer than fourth and fifth combined ... ... *variegatus*

Third joint no longer than fourth and fifth combined, if as long.
Fifth to tenth joints of antennae strongly serrate (subramose).
Antennae black ... ... *ater*
Antennae reddish ... ... *serraticornis*
Antennae scarcely serrated.
Derm of elytra entirely black ... ... *howensis*
Base of elytra more or less diluted with red ... ... *tenuicornis*

ENTOMOPHTHALMUS DECIPIENS, n. sp.

Black; tip of prothorax, antennae, and legs (femora infuscated) reddish. Uniformly clothed with short ashen pubescence.

Head with dense partially-concealed punctures; with a short medio-basal carina. Antennae long, thin, and lightly serrated, second and third joints very short, fourth almost as long as fifth, fifth to tenth subequal in length, eleventh distinctly longer. *Prothorax* strongly transverse, quite parallel-sided except for the slightly rounded front angles, basal angles acute and acutely carinated, with a short medio-basal carina, front margin with a fine carina, each side of which has a short spur projecting obliquely backwards; with dense small punctures. *Elytra* feebly diminishing in width posteriorly; with crowded asperate punctures at base and on tips, becoming smaller and more clearly defined elsewhere, near suture and on tips with fairly well-defined striae, elsewhere with but feeble remnants of same. *Prosternal sulci* deep, narrow, and parallel-sided, except at extreme base; propleural parallelograms about four times as long as wide. Length, $2\frac{3}{4}$ mm.

Hab.—Northern Queensland (Blackburn's Collection). Type (unique), I. 5729.

In general appearance, except as to the antennae, very close to *Microrhagus serraticornis*. Bonvouloir's figure of *E. interruptus* (pl. xxv., fig. 9) will give a good general idea of the species. The antennae at first appear to be quite distinctly ten-jointed, but on close examination the supposed third joint is seen to be really two, the third being very short and closely applied to the base of the fourth; under a compound power the suture between them is seen to be oblique, and the third to be about one-fourth of the fourth and much shorter than the second (in this respect it seems to be similar to *loriai*, from New Guinea). The only other Australian species of the genus *(uniformis)* was described by Blackburn as "rufo-ferrugineous."

HEMIOPSIDA.

Macleay: Trans. Ent. Soc. N.S. Wales, 1872, p. 261; Lea: Proc. Linn. Soc. N.S. Wales, 1895, p. 230.

Lycaon, Bonvouloir: Ann. Soc. Ent. Fr., 1870, p. 718 (*N. pr.*).

Neolycaon, Blackb.: *ante*, 1900, p. 49.

The genus *Hemiopsida* was proposed by Macleay for a species, *mastersi*, which I have already recorded as a probable synonym of *Lycaon novus*. The genus itself was referred to the *Elateridae*, following *Dicteniophorus*, but without its affinities being noted. Previously the genus had been named *Lycaon* by Bonvouloir, but that name having been already in use, Blackburn (overlooking my previous note) proposed for it the name *Neolycaon*. In the genus the antennae of the male are considerably longer than those of the female, and the eleventh joint is conspicuously longer.

HEMIOPSIDA CONCOLOR, Lea (*Lycaon*).

This species was doubtfully referred to *Lycaon*, with the general outlines of which it is certainly in close agreement, but the sides of the prosternum are shallowly grooved (distinctly in front) for the partial reception (up to about the ninth joint) of the antennae, the grooves, however, are not of the deep nature and closed posteriorly as those of *Fornax* and other genera, and are not margined within, although the lateral margin bounding each is carinated. Probably a new genus will be eventually required for it, but the type (and only specimen I have seen) having lost the tips of both antennae and all the claw joints, it appears desirable not to propose such a genus at present.

HEMIOPSIDA KRAATZI, Bonv. (*Lycaon*).

Specimens of this species are readily distinguished from those of *nova* and *nigricans* (some specimens of which they closely resemble) by the very short second and third joints of antennae, the combined length of these being less than that of the first or fourth. The antennae usually have the basal joint blackish, but occasionally they are entirely pale; the abdomen is sometimes of a rather bright red, but is usually no paler than the rest of the under-surface. One male is entirely of a dingy-red, except for a narrow blackish border, where the prothorax, scutellum, and elytra meet. Two females evidently belong to the species, but they differ from the males in being longer and wider, elytra less narrowed posteriorly, antennae considerably shorter, the three apical joints much shorter and less cylindrical (the eleventh, however, is conspicuously longer than the tenth), the combined

length of the second and third joints is rather more than that of the fourth, but the third is conspicuously shorter than the fourth. The size ranges from $6\frac{1}{2}$ to $12\frac{1}{2}$ mm. The type was recorded as from New Holland. The specimens before me are from New South Wales (Dorrigo and Bellingen).

Hemiopsida ventralis, n. sp.

Castaneous; head, pronotum (a large discal patch excepted), part of sterna, and basal joint of antennae, black or blackish. Rather densely clothed with whitish pubescence.

Head with crowded punctures of moderate size; a subfoveate impression between antennary sockets; clypeus widely depressed in middle. Antennae extending to about one-fifth from apex of elytra, second joint very short, third to tenth moderately serrated, third slightly longer than first or fourth, fourth-tenth subequal in length, eleventh almost as long as ninth and tenth combined. *Prothorax* with sides obliquely and almost evenly increasing in width to base, with an irregular shining median line on basal half; with punctures much as on head. *Elytra* parallel-sided to beyond the middle; with rather small but dense and irregular punctures, becoming crowded about base; striation rather lightly impressed, but becoming deep posteriorly. *Abdomen* with a wide and deep impression on each side of middle. Length, $6\frac{1}{2}$ mm.

Hab.—Queensland: Cairns district (A. M. Lea). Type (unique), I. 5744.

The depression on each side of the abdomen commences about the middle of the first segment, and terminates at the tip of the third, its inner wall is almost vertical; at first glance the depressions appear to be due to irregular contractions, but they are alike on both sides; they are wider than on *longicornis*, commence and end sooner, and are much less conspicuously clothed. The second joint of the antennae is paler than the following ones; the pale portion of the pronotum is almost circular in outline.

Hemiopsida mediana, n. sp.

Deep-black, tarsi obscurely reddish. Moderately clothed with short stramineous pubescence.

Head densely granulate-punctate, with a shallow depression between antennary sockets and another on clypeus. Antennae extending to about middle of elytra, second joint very short, third slightly shorter than first, and slightly longer than fourth, fourth-tenth subequal in length, eleventh distinctly longer. *Prothorax* rather strongly convex, sides gently rounded, hind angles acute and clasping shoulders,

median line well defined throughout; with dense but sharply-defined punctures, becoming crowded on sides. *Elytra* scarcely wider than extreme base of prothorax, parallel-sided to beyond the middle; with crowded punctures throughout, but somewhat larger about base than elsewhere; striation well defined, becoming deep about apex and sides. *Abdomen* with a feeble depression towards each side of each segment. Length, 6½ mm.

Hab.—Queensland: Mount Tambourine (A. M. Lea). Type, I. 5743.

A small black species, but readily distinguished from *nana* by the conspicuous median prothoracic line. The serrations of the antennae are very feeble. A specimen from the Blackall Ranges (H. Hacker's No. 897) differs from the type in having the elytra and part of the antennae obscurely diluted with red, and with the tarsi of a rather bright castaneous.

Table of species known to me:—

Prosternum with a shallow channel on each side, but acutely bounded outwardly ...	*concolor*
Prosternum not so channelled.	
Abdomen strongly longitudinally excavated on each side of middle.	
The excavations terminate on the third segment	*ventralis*
The excavations terminate on the fourth segment	*longicornis*
Abdomen not longitudinally excavated.	
Third joint of antennae much shorter than fourth	*kraatzi*
Third joint slightly longer than fourth, or at least almost as long.	
Prothorax with a distinct median line ...	*mediana*
Prothorax without such.	
Elytra black	*nana*
Elytra not black (7)	*nova*, *nigricans*

Dyscolocerus.

To this genus, proposed by Bonvouloir upon a single species from Sumatra, Blackburn has added three species and I have added one and know several others; but it is probable that all the Australian species will eventually be considered as belonging to a new genus.

Dyscolocerus concolor, Blackb.

There are in the Museum three co-type males of this species. Blackburn described the sexes as differing in the apical segment of abdomen, that of the male being lightly

(7) On some large females of *nigricans* the elytra are almost black.

angulate towards the apex; but the margins of the apical segment of these males are exactly the same as on three females before me. The sexes, however, may be readily distinguished by the antennae; on the male the three apical joints are distinctly longer than the seven preceding combined, and the eleventh joint is slightly longer than the eighth, and much longer than the tenth; on the female the three apical joints are less cylindrical, shorter than the seven preceding combined, and the ninth and eleventh are of equal length, and not much longer than the tenth. The species occurs in New South Wales (Forest Reefs), as well as in Tasmania.

Dyscolocerus fuscus, n. sp.

Of a uniform dingy castaneous-brown, legs somewhat paler. Densely clothed with rather short, stramineous pubescence.

Head evenly convex; with crowded punctures. Antennae with second joint about as long as fourth, third about as long as fourth and fifth combined, fourth-eighth equal in length and slightly longer than wide, ninth about as long as seventh and eighth combined, as long as eleventh, and slightly longer than tenth. *Prothorax* strongly rounded in front, then parallel-sided to base, median line distinct; punctures slightly larger than on head, crowded on middle, still more crowded on sides. *Elytra* parallel-sided to beyond the middle; with crowded punctures at base, elsewhere with somewhat smaller granulate punctures; striation well defined. Length, 7-8 mm.

Hab.—South Australia: Murray River (H. S. Cope). Type, I. 5746.

A compact species, with outlines much as those of *porosus* and *rubriventris*, and distinctly wider than *concolor*. On account of the ninth joint of antennae suddenly much longer than the eighth, and the comparatively wide prothorax, the species has been referred to *Dyscolocerus* rather than to *Hemiopsida*. In some lights the pubescence has a golden gloss. The two specimens in the Museum are probably females.

Dyscolocerus aureopilosus, n. sp.

Of a uniform dingy castaneous-brown, legs and antennae somewhat paler. Densely clothed with golden pubescence.

Head with crowded punctures; gently depressed between antennary sockets. Antennae long and rather thin, second joint almost as long as fourth, third as long as fourth and fifth combined, fourth-eighth subequal, ninth-eleventh slightly longer than seven preceding joints combined, ninth about as long as three preceding joints combined, slightly longer than tenth, and slightly shorter than eleventh. *Prothorax*

rather strongly rounded in front, and then with sides feebly dilated to extreme base, median line fairly distinct on apical half, but not traceable to base; punctures much as on preceding species. *Elytra* parallel-sided to beyond the middle; punctures and striae much as on preceding species. Length, 8 mm.

Hab.—New South Wales: Dorrigo (H. J. Carter). Type (unique), I. 5752.

In general appearance strikingly close to the preceding species, but prothorax less transverse, more rounded in front, sides less parallel and with hind angles diverging outwards, median line less conspicuous in front, and not traceable to base. The antennae are strikingly different, but they are probably sexually variable in both; the type of the present species is probably a male.

As I do not know *heros* and *victoriensis*, they have been excluded from the following table, but the former would be associated with *basalis* and the latter with *concolor*.

Elytra partly black	*basalis*
Elytra entirely black.	
Abdomen conspicuously paler than sterna ...	*rubriventris*
Abdomen concolorous, or almost so, with sterna	*porosus*
Elytra nowhere black.	
Prothorax without median line	*concolor*
Prothorax with median line.	
Prothorax with basal half parallel-sided ...	*fuscus*
Prothorax with basal half diverging to extreme base	*aureopilosus*

Nematodes, Latreille.

Fam. Nat., 1825, p. 248; Lacord., iv., p. 113; Bonv., Mon., p. 644.

Nematodes major, Bonv.

Mon., p. 668, pl. xxxii., fig. 3.

Dromoeolus thoracicus, Lea.

The genus *Nematodes* was not recorded from Australia in Masters' Catalogue, and Bonvoulcir described *major* as from Victoria, in the United States. This mistake has been already pointed out by Fleutiaux (Ann. Soc. Ent. Belge, 1897, p. 257), who records it from Melbourne. The late Rev. T. Blackburn has already noted that *Dromoeolus thoracicus* is a *Nematodes*, and I am now convinced that it is a pure synonym of *N. major*. The species varies in length from 6 to 10 mm. Two specimens from Merimbula probably belong to the species; they differ from the others before me in being smaller (5-5½ mm.), much paler, and with the discal impressions of the pronotum scarcely traceable.

Hab.—New South Wales, Victoria, and Tasmania.

Eumenes bakewelli, Bonv.

This species ranges from 11 to 14 mm. in length, and occurs in Tasmania as well as in Victoria.

Dromoeolus dignoscendus, Bonv.

The description of this species is but little more than a comparison with *ferruginipes* from Waigiou, the only reference to colour being *"la couleur des tarses est plus claire."* The length (variable in all the species known to me) was given as 5 mm. There are four specimens before me from Tasmania (the type was from Melbourne), that possibly belong to the species; they are black, antennae (basal joint excepted) obscurely diluted with red, and tarsi and knees rather more conspicuously red (although not brightly so). The pubescence is rather dense and irregularly distributed. The second and fourth joints of antennae are short, subequal, and their combined length about equal to that of the third. Of the other black Australian species it is distinguished from *australasiae* by the non-carinated head and fourth joint of antennae much shorter than the third, and from *lugubris* by the non-carinated head and paler appendages.

The four Australian species of the genus may be tabulated as follows:—

Derm dull reddish-brown	*interioris*
Derm black.	
Head non-carinated	*dignoscendus* (?)
Head carinated.	
Third and fourth joints of antennae subequal	*australasiae*
Third joint much longer than fourth ...	*lugubris*

Arisus.

The species of this genus in general appearance are much like those of *Fornax*, but are distinct therefrom by short oblique sulci on the metasternum; to see these clearly, however, it is necessary to force the legs aside. All the species have the head more or less conspicuously tricarinated in front, with the median carina sometimes continuous from base to apex; on some specimens the median carina is very feeble on the clypeus, so that then the elevations resemble a thin Y.

Arisus depressus, Bonv.

A specimen from New South Wales (Tamworth) probably belongs to this species, but it differs from the description in being somewhat smaller ($4\frac{1}{2}$ instead of 6 mm.); the carina on its head, from the junction of the oblique ones on the clypeus, is very conspicuous to the base. The sutural stria on each elytron is well defined throughout, and about the base the

others are fairly distinct, but they are very feeble or altogether wanting elsewhere. Of the striae Bonvouloir remarks: —"*Elytris non striatis*"; but again, "*sans traces de stries distinctes, sauf la juxta suturale.*" A specimen from South Australia (Monarto) is a little smaller (5½ mm.) than the type; in addition to size, it differs from the Tamworth one in having the carina on the basal part of the head much less distinct, although traceable, and the elytral striation rather more pronounced.

ARISUS CARINATICEPS, n. sp.

Black; suture, under-surface, antennae, and legs more or less obscurely reddish. Densely clothed with stramineous pubescence.

Head with a conspicuous median carina from base to apex, clypeus with an oblique carina on each side joining the median carina between the antennary sockets; punctures crowded and rather small. Antennae moderately long, second joint short, third slightly longer than fourth, fourth-tenth equal in length, but feebly decreasing in width, eleventh longer. *Prothorax* with sides rounded in front and then oblique to base; with dense and rather small but sharply-defined punctures, becoming crowded on sides; with a narrow, shining, continuous median line. *Elytra* feebly decreasing in width from near base; with dense granulate punctures about base, posteriorly becoming smaller, sparser, and less asperate; striation well defined, except about middle of each elytron. Hind *coxae* at sides about half as long as their greatest length; basal joint of hind tarsi about as long as the rest combined, third triangular and deeply bilobed. Length, 5½-6 mm.

Hab.—New South Wales: Dorrigo (W. Heron); Victoria: Benalla (R. Helms). Type, I. 5734.

Differs from *depressus* in having the derm black and prothorax with a shining median line. The metasternal sulci are partially concealed by the middle femora, but are conspicuous when these have been forced aside.

ARISUS MINUTUS, n. sp.

Bright castaneous. Densely clothed with short, stramineous pubescence.

Head with a strong median carina, but becoming rather feeble on clypeus, the latter with a thin oblique one on each side joining the median one between the antennary sockets; with dense and rather small, partially-concealed punctures. Antennae rather short, second joint short, third rather wide, distinctly longer than fourth, fourth-tenth subequal in length

and rather strongly serrated, eleventh distinctly longer. *Prothorax* with sides rather strongly rounded in front, with a shining median carina on basal third; with small and rather dense punctures, becoming denser on sides. *Elytra* slightly diminishing in width from near base; with rather dense asperate punctures about base, much smaller and sparser elsewhere; striation well defined about suture and base, finer or wanting elsewhere. Length, 4 mm.

Hab.—New South Wales: Sydney (W. du Boulay). Type (unique), I. 5735.

The hind coxae are much as in the preceding species, but the tarsi are missing; the species differs from the description of *depressus* in being smaller (it is considerably smaller than any previously described species of the genus) and antennae not filiform but quite strongly serrated; the prothoracic punctures are also considerably finer than on a species I have, with some slight doubts, identified as *depressus*. The metasternal sulci are very short, oblique, and close to the leg, and to see them clearly the femora must be forced aside; each appears as the apex of a much wider and somewhat deeper depression on the flank.

Fornax.

This genus is the most abundant in species of all the *Eucnemidae*, and the species at first glance are mostly strikingly alike in general appearance, but they may usually be readily distinguished by characters of the head and antennae. In Blackburn's table the genus is distinguished by "Basal joint of hind tarsi as long as all the other joints together"; this is true of most of the species before me, but on several of them the basal joint is either slightly or quite conspicuously shorter than the rest combined; these, however, may be distinguished from *Discaptothorax* by the considerably narrower latero-prosternal grooves.

Fornax parvulus, Bonv.

There are five specimens of *Fornax* before me that differ from all the others in having the fourth and fifth joints of antennae subequal in length and exceptionally short, their combined length being equal or subequal to that of the sixth. I cannot satisfy myself, however, that they belong to but one species, although possibly they all belong to *parvulus*. The smallest specimen ($5\frac{1}{2}$ mm., similar in length to the type) is from Tasmania, and has the tip of the abdomen almost pointed (certainly not *"late rotundato"*), the fourth and fifth joints of antennae are strongly transverse, and their combined length is slightly less than that of the sixth, and the sixth to ninth joints are slightly dilated. A specimen

from Northern Queensland is of similar length, but is slightly wider, the fourth and fifth joints slightly longer (but still transverse), and together quite as long as the sixth; the tip of the abdomen could fairly be called widely rounded (possibly the tip is sexually variable). Two from New South Wales (Galston) are similar to the Tasmanian specimen, except that they are larger (6-8 mm.). A specimen from Victoria is still larger (9 mm.), with the fourth and fifth joints combined just perceptibly longer than the sixth. The species was recorded from Tasmania, but was omitted from Masters' Catalogue.

FORNAX SUTURALIS, n. sp.

Black; tarsi and apical half of antennae obscurely diluted with red. Clothed with short, depressed pubescence.

Head with crowded punctures; with a narrow carina connecting the antennary sockets and continued along same to eyes, a short longitudinal one in middle. Antennae short, third joint longer than fourth, fourth to tenth subequal in length and very feebly serrated, eleventh conspicuously thinner and longer than tenth. *Prothorax* with front angles rather strongly rounded, then parallel-sided to base; with crowded but rather small punctures; median line vaguely depressed in front, very distinct towards base, a shallow, transverse depression on each side at base, the derm between each depression and the median line distinctly elevated. *Elytra* with crowded subasperate punctures about base, becoming smaller and more sharply defined posteriorly; striation well defined throughout. Hind *coxae* at sides about half as long as their greatest length, this about equal to length of second abdominal segment; basal joint of hind tarsi as long as the rest combined. Length, $3\frac{1}{2}$-$5\frac{1}{4}$ mm.

Hab.—New South Wales: (W. du Boulay); Dorrigo (W. Heron and H. J. Carter). Type, I. 5739.

The pubescence on the under-surface is uniformly short and pale, on the upper-surface it is pale on the head, basal third of prothorax, and basal sixth and suture of elytra; on the rest of the upper-surface the pubescence is black, but visible only from the sides or an oblique direction; on some specimens the pale sutural pubescence is confined to one interstice on each elytron, but on others the space so covered is dilated about the middle.

FORNAX PARVONIGER, n. sp.

Black, antennae and legs more or less obscurely diluted with red. Clothed with short, depressed pubescence, somewhat

ashen on head, at base of prothorax and of elytra, and on under-surface; darker elsewhere.

Head evenly convex; with small dense punctures, becoming crowded in front; inter-ocular carina rather feeble and interrupted in middle. Antennae rather thin, second joint slightly longer than fourth and decidedly shorter than third, fourth to tenth subequal and feebly serrated, eleventh almost as long as ninth and tenth combined. *Prothorax* rather strongly convex in front, front angles rounded, sides thence feebly increasing in width to base, median line shallow on basal third, scarcely traceable elsewhere; sides with small and moderately dense punctures, becoming smaller and sparser about middle. *Elytra* distinctly narrowed from base to apex; with crowded asperate punctures about base, becoming sparser and more sharply defined elsewhere; striation distinct about base and suture, rather feebly defined or absent elsewhere. Hind *coxae* strongly and evenly narrowed to sides, greatest length distinctly more than that of second abdominal segment; basal joint of hind tarsi as long as the rest combined. Length, 3½-4 mm.

Hab.—Queensland: Cairns district (A. M. Lea). Type, I. 5740.

Close to *suturalis*, but head without longitudinal carina, inter-ocular carina slightly interrupted in middle, prothorax with much smaller punctures and median line more feeble, elytra less parallel-sided, with smaller punctures, and less conspicuous striation and hind coxae longer.

Fornax carinatifrons, n. sp.

Black, tarsi obscurely diluted with red. Clothed with short, depressed pubescence.

Head with crowded distinct punctures; inter-ocular carina well defined throughout. Antennae with second joint short, third slightly longer than fourth, fourth to tenth subequal, eleventh slightly longer. *Prothorax* with front angles rather strongly rounded, sides thence parallel-sided to base, median line well defined on basal half only; punctures towards margins as on head, somewhat larger about middle. *Elytra* feebly diminishing in width from near base; with crowded but sharply-defined punctures, larger and more crowded about base than elsewhere; striation well defined throughout. Hind *coxae* at sides scarcely one-half their greatest length, this slightly more than that of second abdominal segment; hind tarsi rather short, basal joint about as long as the rest combined, claw-joint very thin. Length, 3¾-5½ mm.

Hab.—Queensland: Cairns district (A. M. Lea). Type, I. 5742.

Readily distinguished from the preceding species by the coarser prothoracic punctures and more regular elytral striation; the inter-ocular carina is also not interrupted in middle. On the head, base of prothorax and of elytra, and on the under-surface the pubescence is paler than elsewhere, but from some directions, even on those parts, it appears to be black; on one specimen the pale pubescence on the elytra is confined to about the basal fifth, on the type it is extended to the basal fourth, and in addition is triangularly continued along the suture to the apical fifth. Most of the joints of the antennae, when viewed at right angles to their greatest width, appear to be subquadrate or briefly oblong.

FORNAX INTERRUPTUS, n. sp.

Bright castaneous, elytra somewhat darker. Uniformly clothed with stramineous pubescence.

Head strongly convex; with dense and rather small punctures, becoming crowded in front; inter-antennary carina interrupted in middle. Antennae moderately long, second joint short, third almost as long as fourth and fifth combined, fourth slightly shorter than fifth, and fifth than sixth, sixth-tenth subequal, eleventh distinctly longer. *Prothorax* with front angles rounded off, sides thence parallel-sided to base; with rather dense and small punctures, becoming crowded on sides. *Elytra* almost parallel-sided to beyond the middle; rather densely granulate-punctate about base, punctures smaller and sparser elsewhere; striation well defined throughout. Hind *coxae* narrowed almost to points at the sides, greatest length more than that of second abdominal segment; hind tarsi with basal joint about as long as the rest combined. Length, 5-5½ mm.

Hab.—Queensland: Mount Tambourine (A. M. Lea), Brisbane (Dr. A. J. Turner); New South Wales: Dorrigo (W. Heron). Type, I. 5733.

Apparently close to *additus*, but fourth and fifth joints of antennae almost the same size and punctures evidently smaller. The fourth and fifth joints are each slightly shorter than the sixth, not strikingly so as on *parvulus*. There is a vague remnant of a median line close to the base of the prothorax, but not of a carina.

FORNAX ORTHODOXUS, n. sp.

Bright castaneous. Densely clothed with short stramineous pubescence.

Head strongly convex; with crowded and rather coarse punctures; inter-antennary carina widely interrupted in middle. Antennae moderately long, second joint short, third

almost as long as fourth and fifth combined, fourth slightly shorter than fifth, and fifth than sixth, sixth-eleventh subequal. *Prothorax* with front angles rounded, sides thence parallel to base; with crowded and not very large but subrugose punctures, becoming still more crowded on sides. *Elytra* feebly diminishing in width from near shoulders; rather densely granulate-punctate about base, punctures smaller and more clearly defined elsewhere; striation well defined throughout. Hind *coxae* narrowed almost to points at the sides, greatest length equal to that of apical segment of abdomen (this rather acutely pointed and with numerous small granules); basal joint of hind tarsi as long as the rest combined. Length, $4\frac{3}{4}$ mm.

Hab.—Queensland: Cairns district (A. M. Lea). Type (unique), I. 5751.

A rather narrow species. The pronotum from some directions appears to be covered with small granules instead of punctures. The eleventh joint of antennae is just perceptibly longer than the tenth: in fact, from some directions it appears to be a trifle shorter.

FORNAX SUBOPACUS, n. sp.

Castaneous, head and prothorax without gloss, elytra and under-surface very feebly shining. Densely clothed with short, stramineous pubescence.

Head with crowded, partially-concealed punctures; interantennary carina not continued across middle. Antennae moderately long, first joint scarcely longer than third, second very short, third to tenth serrated, third about once and one-half the length of fourth, fourth to tenth subequal in length but gradually decreasing in width (eleventh missing). *Prothorax* with sides rounded in front; very densely and rugosely punctate; towards base with feeble remnant of a median line. *Elytra* parallel-sided to beyond the middle; with dense punctures throughout, but more rugose about base than elsewhere; striation well defined. Hind *coxae* strongly but curvilinearly decreasing in width to sides, greatest length scarcely more than that of second abdominal segment; hind tarsi with basal joint slightly shorter than the rest combined, fourth slightly narrower than third. Length, $4\frac{3}{4}$ mm.

Hab.—Queensland: Cairns district (A. M. Lea). Type (unique), I. 5750.

The opaque head and prothorax (due principally to density of punctures) should alone readily distinguish the species from all other Australian ones of the genus. The tarsi are rather shorter and the lateral sulci of the prosternum rather wider than are usual in *Fornax*.

Table of species known to me:—

A. Derm black.
  a. Head with a short longitudinal carina.
    b. Third joint of antennae longer than fourth — *suturalis*
    bb. Third joint shorter than fourth ... ... — *niger*
  aa. Head not longitudinally carinate.
    c. Pronotum with minute, ill-defined punctures on disc ... ... — *parroniger*
    cc. Pronotum with larger, sharply-defined punctures ... ... — *carinatifrons*
AA. Derm more or less castaneous.
  B. Fourth and fifth joints of antennae combined no longer than sixth, if as long — *parvulus*
  BB. Fourth and fifth joints combined longer than sixth.
    C. Derm of pronotum opaque ... ... — *subopacus*
    CC. Derm of pronotum shining.
      D. Eleventh joint of antennae just perceptibly longer than tenth ... ... — *orthodoxus*
      DD. Eleventh joint conspicuously longer than tenth.
        E. Widest part of prothorax not the extreme base.
          d. Prothorax with a feeble median line, but traceable throughout — *norfolcensis*
          dd. Prothorax without such a line ... — *howensis*
        EE. Widest part of prothorax the extreme base.
          F. Elytra somewhat darker than prothorax ... ... — *interruptus*
          FF. Elytra no darker than prothorax.
            G. Comparatively large and robust — *majorinus*
            GG. Smaller and thinner.
              H. Basal joint of hind tarsi longer than the rest combined ... ... — *talayroides*
              HH. Basal joint shorter than the rest combined ... ... — *castaneus*

DYSTRIGONISTHIS PARADOXUS, Blackb.

The type of this species was from North Queensland (probably from Cairns). There are four specimens from Cairns, nine from New South Wales (Forest Reefs), and three from South Australia (Mount Lofty and Adelaide), that appear to belong to the species. They vary in length from 5 to 10 mm. (the type was about 7 mm). Their elytral striae are peculiar; at the greatest width (just above the metasternum) each has eleven, of these the tenth vanishes level with the apex of the first abdominal segment, the ninth and eighth meet near the apex, and then, as one, deepens and continues till it joins the first, the second and third vanish at about one-fourth from the apex, the fifth and sixth become conjoined and terminate nearer the apex, and the fourth and seventh become conjoined and terminate still nearer the apex.

GALBOCERUS, n. g.

Head convex, antennary sockets large, not closely approximated; clypeus trisinuate in front. Antennae flabellate. *Prothorax* moderately transverse. *Elytra* parallel-sided to beyond the middle. *Prosternum* with a wide and deep excavation on each side of base; propleural triangles each margined inwardly by a distinct carina, extending from front coxa to level with the middle of the eye, margined outwardly by the overhanging side of pronotum. Metasternum with two side pieces on each side, the outer one (the true episternum) rather thin and parallel-sided, the inner one hooked at base and narrowed till it disappears slightly before the apex. Hind *coxae* long inwardly, strongly and evenly narrowed (almost to a point) outwardly; tarsi with fourth joint wide and strongly produced on lower-surface, claws each with a wide and conspicuous membranous appendix.

The type and only specimen in the Museum is, in general appearance, strikingly like *Microrhagus cairnsensis* on an enlarged scale, but it differs from *Microrhagus* in having propleural triangles instead of parallelograms, in the prosternal and metasternal sutures, tarsi, etc. *Galbodema* has wide and deep prosternal sulci. *Galba* has deep prosternal sulci and very different tarsi. No other Australian genus has been recorded as having species with flabellate antennae. The flanks of the pronotum are overhanging, so as to provide protection for the antennae when at rest (much as on *Phaenocerus clavicornis*), but as the propleural triangles are flat up to (although polished near) the overhanging margins the prosternum cannot be regarded as having lateral sulci (as in *Galba*, *Galbodema*, etc.); there is, however, a wide and deep excavation on each side at the base for the reception of the femur. The head of the type being closely applied to the breast, with the palpi partially concealing them, I have not been able to see if the hind edge of the mandibles is strongly sinuous, but believe it to be so. Regarding it as such, the genus, in Blackburn's table, would be associated with *Hypocoelus*, from which it differs in the antennae, tarsi, and metasternum. Regarding it as belonging to CC of that table, it would be associated with *Eumenes*, which has very different sides of prosternum, metasternum, antennae, and claws. I am dubious as to its correct position, but provisionally it may be placed near *Phaenocerus*.

GALBOCERUS PARALLELUS, n. sp.

Piceous-brown (almost black), antennae and legs of a dingy-red. Rather densely clothed with short, stramineous pubescence.

Head with densely crowded and rather shallow punctures, subgranulate in places. Antennae with first joint slightly longer than the space between antennary sockets, second very short and strongly transverse, third slightly longer than fourth and the length of fifth, the others to ninth (two apical joints missing) slightly increasing in length; ramus of third to ninth each about thrice the length of its supporting joint. *Prothorax* with sides rather strongly rounded in front, thence parallel-sided to base, with a feeble foveate impression on each side of middle; very densely punctate, towards the margins granulate-punctate. *Elytra* almost continuously parallel-sided with prothorax to beyond the middle; very densely granulate about base, granulate-punctate elsewhere; striation well defined throughout. Four hind *tarsi* with basal joint as long as the rest combined, basal joint of front tarsi as long as the next three combined. Length, 11 mm.

Hab.—North-western Australia: Port George IV. (J. R. B. Love). Type (unique), I. 5748.

There are very vague remnants of a median line on the prothorax, the discal foveae are feeble, but quite distinct from certain directions.

MALACODERMIDAE.

Laius purpureipennis, n. sp.

♂. Purple; two basal joints of antennae flavous, rest of antennae, legs, and under-surface black. Densely and finely pubescent.

Head with dense and very minute punctures. Antennae rather long; first joint long and of irregular shape, second large and distorted, the following joints small. *Prothorax* distinctly transverse, front truncate, sides strongly rounded; punctures as on head. *Elytra* with sides feebly dilated to beyond the middle; scarcely visibly punctate. Front *femora* obliquely excavated in front; front tibiae dilated towards base, and obliquely sulcate on inner side near base. Length, 4-4½ mm.

♀. Differs in having two basal joints of antennae very different and the front femora and tibiae simple.

Hab.—Northern Territory: Darwin and Melville Island (G. F. Hill's No. 377). Type, I. 5687.

A remarkable species, and the only one at all close to *alleni*, from which it may be at once distinguished by the two basal joints of antennae; of these the first is dilated towards apex, with the apical portion wide and its summit oblique, from some directions appearing subangular near its outer apex; the second is slightly wider than long, joined to the first on one side, and to the third in the middle, its

upper-surface irregularly concave, with an opening near where it joins the first joint, but with the hollow space inside almost labyrinthic (although of large size it is so largely excavated that it appears little more than a thin irregular shell, convex on the lower-surface). On the female the first joint is somewhat shorter and simple, the second is simple, subparallel-sided, and about as long as the third and fourth combined. On *alleni* the first joint of the male is more irregular about apex, the second is much smaller, differently joined to the first and third, and its upper-surface totally unlike that of present species. The head, prothorax, and scutellum are of a different shade of purple to the elytra.

CURCULIONIDAE.

Mandalotus abdominalis, Lea.

On some specimens of this species in perfect condition the clothing is more conspicuously variegated than on the types, being of a rusty-brown, mottled with darker and paler spots, on each elytron there is usually a pale, conspicuous spot on the third interstice about the middle. On these specimens also the transverse arrangement of the prothoracic granules is fairly distinct, even before abrasion.

Mandalotus latens, Lea.

On fresh specimens of this species the clothing is more or less rusty- or muddy-brown, but rather conspicuously variegated with numerous small, irregularly disposed, pale spots.

Mandalotus interocularis, Lea., var.

Two specimens (sexes) from the Glenelg River (Victoria, J. Rau) appear too close to *interocularis* to be described as new; but the abdominal carina of the male is more convex, not quite so close to the apex of the segment, the metasternum is slightly more concave, the elytra have feeble tubercles on the third, fifth, and seventh interstices about the apical slope, and the front tibiae are stouter towards and less curved about the apex. The female has the conspicuous inter-ocular tubercle as on the type female. In the 1914 table, regarding the elytra as tuberculate, the variety would be associated with *arciferus*, but on the male of that species the middle of the abdominal carina almost touches the apex of the segment.

Numerous specimens of the ordinary form have been taken by Mr. Secker at Lucindale.

Mandalotus transversus, Lea.

The types of this species are females, although they were described as probably being males; but Dr. Ferguson has

sent additional specimens from Dorrigo, one of which is a male. It differs from the female in having each of the middle coxae conspicuously armed with an upright, obtusely-pointed ridge; the basal segment of the abdomen is flat, with the base and sides of the intercoxal process conspicuously elevated, the front tibiae are stronger and more curved, and are conspicuously ciliated; the hind tibiae have their apical three-fifths largely scooped out on the inner side, so that when viewed from most directions each appears moderately curved on the outer side and very strongly on the inner, the scooped-out part commences so suddenly that, from some directions, it appears to start from a subbasal tooth: there are also two contiguous medio-basal foveae (small but conspicuous) on the prosternum. The clothing of the fresh specimens is more of a rusty-red than on the types, and the apical slope is rather less uneven. The female could still be assigned to the position given it in the 1914 table of the genus, but the male would be associated with *dentipes*, from which it differs in its different and more conspicuous dentition of middle coxae and very different hind tibiae; the hind tibiae of *dentipes* are very decidedly shorter, more regularly diminish in thickness from the base to the dilated apex, and are rather more strongly and evenly curved; that species also is without medio-basal foveae of the prosternum, and has conspicuous bristles on the metasternum and part of the abdomen.

Mandalotus angustus, Lea.

On the middle coxae of the type male of this species there is a shining, slightly-elevated ridge; it is indistinct from some directions, but fairly distinct from others.

Mandalotus squamibundus, Lea.

In the 1914 table of the genus this species was separated from *maculatus* (from which, however, it differs in many respects) by the absence of pale elytral spots. But Dr. Ferguson has sent eight fresh specimens from Bowen for examination, and nearly all of these have four rather feeble pale spots at the base of the elytra, and a few still more feeble ones scattered about elsewhere.

Mandalotus nodicollis, Lea.

Some specimens of this species from Townsville are evidently in perfect condition, without the muddy crust that usually conceals the clothing. The clothing is very dense, of a light muddy-brown or grey, with numerous pale spots scattered about on the head, prothorax, elytra, and legs; on some specimens the spots have a silvery lustre, or even a

slightly greenish or golden one. The ocular lobes are unusually feeble and the emargination of the prosternum less pronounced than is usual in the genus.

MANDALOTUS TENUICORNIS, Lea.

Numerous specimens of this species have been taken at Robe by Messrs. Feuerheerdt and Secker. Their clothing varies from that of the types to a dingy greyish-white or slaty-white, more or less conspicuously mottled with sooty or sooty-brown. On the males the sides of the prothorax, near the base, are often distinctly wider than the base of the elytra.

MANDALOTUS HOPLOSTERNUS, n. sp.

♂. Dull reddish-brown, some parts more or less deeply infuscated. Densely clothed with muddy-brown scales, thickly interspersed with stout setae.

Rostrum short, median carina traceable through clothing. Scape rather long and not very stout; second joint of funicle distinctly longer than first. *Prothorax* rather strongly transverse, sides strongly and almost evenly rounded, median line narrow, deep, and almost continuous throughout; with large, subvermiculate, obtuse granules, readily traceable through clothing. *Elytra* somewhat angular, extreme base slightly narrower than widest part of prothorax; with several feeble subtubercular elevations about middle and base and on apical slope, but with a conspicuous tubercle on each side behind shoulder; with rows of large punctures not much smaller on apical slope than about base. *Prosternum* with a conspicuous keel between and in front of coxae. *Abdomen* with basal segment gently depressed in middle. Front *coxae* widely separated; front tibiae triangularly produced at inner apex, hind ones strongly narrowed before and strongly dilated at apex. Length, 6 mm.

Hab.—Victoria: Melbourne (J. W. Mellor). Type (unique), I. 5571.

The prosternum armed in front associates this species with *armipectus* in the latest table of the genus,[8] but on that species (which is also a much smaller one) the armature is like a semi-double transverse ridge; on the present species it is an obtuse, but very conspicuous, longitudinal one. In general appearance its upper-surface is strikingly like that of *incisus*, *simulator*, and *niger*. The prothorax is almost entirely dark, the elytra are dark, but in places conspicuously diluted with red; but the colour of the derm is not to be relied upon in *Mandalotus*. On the elytra the setae are usually pale and confined to the elevated parts.

[8] *Ante*, 1914, p. 298.

MANDALOTUS LAMINIPECTUS, n. sp.

♂. Black, some parts obscurely diluted with red; antennae, tarsi, and tips of tibiae castaneous. Densely clothed with sooty-brown scales, more or less obscurely variegated with ashen ones, and with numerous stout setae scattered about.

Rostrum moderately long, wider at base than at apex, median carina narrow and distinct throughout. Scape moderately stout; two basal joints of funicle long, rather thin and subequal. *Prothorax* moderately transverse, sides rather strongly transvere, median line narrow and rather well defined; with numerous round granules, readily traceable through clothing. *Elytra* at widest slightly wider than prothorax; with rows of large, partially-concealed punctures; some of the interstices irregularly elevated (scarcely tuberculate), but with a fairly conspicuous swelling behind each shoulder. *Mesosternum* with a wide and very conspicuous inter-coxal process. Front *coxae* widely separated; femora very stout; tibiae comparatively short. Length (♂, ♀), 5-5¼ mm.

♀. Differs in having the prothorax more transverse, elytra narrower at the base and wider across middle, mesosternum unarmed, abdomen gently convex, and legs somewhat shorter.

Hab.—Victoria: Glenelg River (J. Rau). Type, I. 5570.

The front coxae are very widely separated, and the separation is accentuated by the coxae themselves being scooped out or obliquely flattened, although this is less conspicuous on the female than on the male. The projection between the middle coxae of the male is very curious; at the base it is about as wide as long, but it obliquely dilates till at the apex it is almost twice as wide as long, with the apices conspicuously elevated and the space between them incurved, the whole process, except for the tips, being depressed below the coxae and concave. Regarding it as notched, it would (in the 1914 table of the genus) be associated with *incisus* and *laminatipes*, but the process in each of those species is very much smaller and of very different shape; their rostrum, front tibiae, etc., are also different. The hind femora of the male from some directions have a deceptive appearance as of being obtusely dentate. On the female the paler scales are almost white, and form feeble spots on the prothorax and elytra, and are rather dense at the base of the head.

MANDALOTUS WEDGENSIS, n. sp.

♂. Black, some parts obscurely diluted with red, antennae and tarsi castaneous. Densely clothed with slaty-grey

scales interspersed with numerous fine setae, the latter becoming long on tibiae.

Rostrum moderately long, median carina feeble. Antennae comparatively long and thin, first joint of funicle slightly longer and conspicuously stouter than second. *Prothorax* lightly transverse, sides moderately rounded, median line feebly impressed; with numerous feeble granules, the depressions about which appear vermiculate through the clothing. *Elytra* at base exactly the width of base of prothorax, but disinctly wider at basal fourth, thence gently rounded to apex; with regular rows of large, partially-concealed punctures; interstices not separately convex, but the fifth and seventh slightly wider than the others. Basal segment of *abdomen* with dense punctures, bounded externally by a distinctly curved carina, the other segments almost impunctate. Front *coxae* widely separated; hind tibiae acutely dentate at inner middle, inner apex acutely spined. Length, 4 mm.

Hab.—South Australia: Wedge Island (Captain S. A. White). Type, I. 5807.

The curvature of the abdominal carina is midway between that of the species DD*e* and *ee* of the 1914 table of the genus; but the species may be readily distinguished from the members of those groups, except *sydneyensis*, by the hind tibiae: *sydneyensis* has much longer and denser setae on the upper-surface, and clothing otherwise different, larger eyes and front coxae less widely separated. The gentle slope of the elytra is not at all interrupted by separate convexity of the interstices.

Mandalotus tibialis, n. sp.

♂. Dark reddish-brown or blackish, some parts (and including the antennae and tarsi) more or less castaneous. Densely clothed with muddy-grey or ashen, obscurely-variegated scales; interspersed with numerous stout setae; front tibiae conspicuously but not densely ciliated.

Rostrum rather short, carina not traceable through clothing. Antennae moderately long and thin; second joint of funicle slightly longer and thinner than first. *Prothorax* moderately transverse, sides rather strongly rounded and widest across apical third, median line narrowly impressed; apparently without granules. *Elytra* distinctly wider than prothorax at base, and somewhat sinuous there, owing to the elevation of the third interstice on each, parallel-sided (except for a small post-humeral tubercle) to beyond the middle, somewhat irregular on and about apical slope; with rows of large, partially-concealed punctures, becoming smaller posteriorly. Front *coxae* rather widely separated, middle coxae

each armed with a strong, recurved, acute tooth; hind tibiae transverely multicarinate internally, front ones variable. Length, $3\frac{3}{4}$-4 mm.

Hab.—New South Wales: Sydney (Old Collection), Blue Mountains, and Rydalmere (Dr. E. W. Ferguson); Mittagong, 2,000-2,500 feet (British Museum, from J. J. Walker). Type, I. 5581.

I cannot satisfy myself that the five specimens before me belong to more than one species; two of them have the elytra about the apical slope subtuberculate and decidedly rougher than on the others, and their front tibiae are apparently strikingly different. On the Sydney and Mittagong specimens the front tibiae have the apical three-fourths arched and granulate on the lower-surface, with the granulated portion suddenly terminating in a conspicuous tooth near the base (somewhat as on *arenaceus*), each of the front femora also has a notch in which the tooth can rest; on the other specimens the tibiae are also granulate, but at the position of the strong tooth there is a gentle swelling only, much as on many other species of the genus. The carinae of the hind tibiae are invisible from most directions. In the 1914 table of the genus, regarding the elytra as tuberculate, the species would be readily distinguished from all those referred to F, and also regarding them as non-tuberculate from all those referred to K, by the middle coxae, the remarkable teeth on these vary somewhat in size, but are conspicuous on all the specimens; they curve obliquely inwards over the intercoxal process; the armature of the middle coxae of *dentipes*, *transversus*, and *scaber* is very different. The prothorax on abrasion is seen to have the disc entirely without granules and to be covered with small dense punctures, mixed with a few of larger size; but the sides appear to have a few feeble elevations. The alternate interstices of elytra are not conspicuously elevated above their fellows, except that the third becomes almost tuberculate at base.

Mandalotus raui, n. sp.

♂. Black, some parts obscurely reddish; funicle and tarsi bright castaneous. Densely clothed with muddy-brown scales, interspersed with stout setae.

Rostrum moderately long, upper-surface with derm entirely concealed by clothing. Scape rather long; funicle thin, first joint thicker and slightly longer than second. *Prothorax* almost as long as wide, sides strongly and evenly rounded, median line feebly impressed; with numerous round granules, slightly traceable through clothing, but conspicuous on abrasion. *Elytra* subarcuate at base, which is wider than

prothorax, sides feebly dilated to beyond the middle; with rows of rather large, almost (or quite) concealed punctures; alternate interstices feebly elevated. Front *coxae* very widely separated, middle ones each with a shining oblique ridge. Length (♂, ♀), 3½-4 mm.

♀. Differs in having the prothorax somewhat smaller, elytra somewhat wider, basal segment of abdomen convex in middle (instead of flat), and legs somewhat shorter, with simple coxae.

Hab.—South Australia: Adelaide, seven specimens from tussocks (J. Rau). Type, I. 5573.

In the 1914 table of the genus would be placed under K after *hh*, and from all the species there placed (except *angustus*) it differs in the middle coxae; from *angustus* it differs in being somewhat smaller, rather more robust, with the front coxae much more widely separated (almost twice the distance), and with the middle coxae more conspicuously carinated (the carina from some directions causes each coxa to appear armed with a subacute conical tubercle). The separation of the front coxae is rather more than in *rufimanus*, and the elytra, although non-tuberculate, are more uneven than on that species. The elytra (except perhaps at their base) could not fairly be regarded as tuberculate; their base is much less conspicuously trisinuate (except for slight encroachments by the third interstices it could fairly be regarded as arcuate) than in *humeralis*. The clothing on all the specimens is very dingy and somewhat obscured by mud, but on two of them there are faint indications of pale spots on the prothorax, and still more faint indications on the elytra.

Mandalotus subhumeralis, n. sp.

♂. Blackish-brown, some parts obscurely reddish; antennae and tarsi castaneous. Densely clothed with muddy-brown slightly-variegated scales and with stout setae.

Rostrum short and stout, median carina traceable through clothing. Scape not very long; first joint of funicle stouter and slightly longer than second. *Prothorax* almost as long as wide, sides and base strongly rounded; with numerous granules conspicuously transversely arranged. *Elytra* subarcuate and wider than prothorax at base, with a conspicuous tubercular swelling on each side just beyond shoulder; with regular rows of large punctures, appearing very small through clothing; odd interstices very feebly elevated above the even ones. Two basal segments of *abdomen* feebly depressed in middle. *Legs* moderately stout; front coxae lightly but distinctly separated. Length, 3 mm.

Hab.—South Australia. Type (unique), I. 5583.

Close to *arcuatus*, with which it would be associated in the 1914 table of the genus, but differs in having the front tibiae less curved at apex, ciliation shorter and sparser, scape somewhat stouter, but in particular by the subhumeral prominence on each elytron. From *crawfordi* (also from South Australia) it is distinguished by its smaller size, narrower form, subhumeral prominences, and abdominal clothing concealing derm. It is about the size and at first glance somewhat the appearance of *Achopera lachrymosa* of the *Cryptorhynchides*. The paler markings consist of an interrupted stripe on each side of the prothorax and numerous feeble spots on the elytra. The clubs and two apical joints of each funicle are missing from the type.

MANDALOTUS INCONSPICUUS, n. sp.

♂. Dull reddish-brown, appendages paler. Densely clothed with light-brown or stramineous scales, somewhat variegated on upper-surface; with numerous stout setae scattered about.

Rostrum moderately long, sculpture of upper-surface entirely concealed. Scape not very long, somewhat inflated to apex; first joint of funicle distinctly longer and wider than second, the others all transverse. *Prothorax* distinctly transverse, sides rather strongly rounded; with dense, normally concealed punctures. *Elytra* elongate-elliptic, shoulders evenly rounded. *Abdomen* flat. *Legs* rather stout; front coxae touching. Length, 2-2½ mm.

♀. Differs in being somewhat larger and wider, abdomen gently convex, and legs shorter.

Hab.—South Australia: Mount Lofty (S. H. Curnow). Type, I. 5587.

In the 1914 table of the genus this species would be associated with *maculatus* and *squamibundus*; from the former it is distinguished by its much denser clothing (entirely concealing the punctures of the upper-surface) and shorter and stouter antennae and legs. From *squamibundus* it is distinguished by its smaller size and slightly narrower form, somewhat shorter antennae and legs, front tibiae less acutely produced at apex, and sparser and less regular elytral setae. On the only female before me the elytral clothing is paler than on the two males and with numerous small chocolate-brown spots; on the males the spotting is very obscure. The setae are unusually stout, even on the legs and under-surface, and on the elytra are confined to a single row on each interstice; they are nearly all stramineous. Before

abrasion the elytra appear to be finely striated, but after abrasion rows of large punctures become evident.

LEPTOPS.

In the table of this genus in Ann. Soc. Ent. Belge, 1916, a line was unfortunately left out; this should have followed immediately after K on page 316, as follows:—"KK—Elytra with few tubercles, or if numerous then obtuse." This line governing all the species that followed.

With long series of many species of the genus one is inevitably forced to the conclusion that the majority are extremely variable. The sexual differences are usually very pronounced, nevertheless with many species the sexes vary towards each other, so that, from an external observation, it is often difficult to be sure of the sex of an individual. As a natural result, many synonyms have resulted, and the acquisition by the Museum of long series of many species taken by Mr. H. W. Brown in the Cue district has made it possible for some of these to be noted, and the plates given (with the exception of five figures all of the members of the group with the breast armed, and comprising most of the giants of the genus) will serve to illustrate the great variability in size and sculpture of some of them.

LEPTOPS DUPONTI, Boi.
var. *interioris*, Blackb.
var. *obsoletus*, Lea.
var. *carinatus*, Lea.
L. tribulus, in error.
Pl. xxxiv.

I previously [9] referred to *interioris* as a variety of *tribulus*, and named two other forms as varieties of the same species. But Mr. Arrow, from examination of the type, has pointed out that our identification of *tribulus* [10] was incorrect, and that the real *tribulus* is the Queensland species known as *ferus*.

In Masters' Catalogue, *echidna* and *duponti* are given as synonyms of *tribulus*, but it has been already [11] pointed out (from examination of the type) that *echidna* is really the

[9] Ann. Soc. Ent. Belge, 1906, p. 327.

[10] The specimens in the late Rev. T. Blackburn's collection identified as *tribulus* were all of the species commonly supposed to be such, and the numerous references in Australian literature apparently all refer to the same species.

[11] *L.c.*, 331, by a printer's error recorded as from "N.," instead of "W." Australia.

species described by Blackburn as *planicollis*, and is a very distinct species. Till evidence to the contrary, therefore, is forthcoming, it is necessary to regard *duponti* as the name of the species hitherto commonly known as *tribulus*.

Plate xxxiv. will give a good idea of the variations in size and sculpture of the species; on fig. 74 there may be noticed a small projection in front of the front legs; this is typical of the group with armed breast, and is entirely absent from the real *tribulus (ferus)*.

Leptops ferus, Pasc.

Pl. xxxix., figs. 156 to 158.

According to a specimen sent for examination by Mr. Arrow, and stated to agree with the type, this is the real *tribulus* of Fabricius. In the side figure (158) the *Catasarcus*-like post-humeral tubercle can scarcely be noted, but on fig. 157 it appears on the right side as a small prominence close to the leg.

Leptops areolatus, Blackb.

L. frenchi, Lea.
L. rudis, Lea.

Pl. xxxvii., figs. 111 to 122.

This species is one of the most variable of the genus. The type (fig. 112) is a rather large male, with the tubercles more obtuse than usual (approaching the female). The normal male (fig. 116) has two rows of more or less conical tubercles on each elytron, the row on the third interstice consisting of from three to seven, on the seventh from five to ten, with the two nearest the apex larger (usually very considerably so) than the others.

The female is usually much larger and much wider than the male, with the elytral punctures sharply defined and limited, but they are very variable; on the types of *frenchi* and *rudis* they are so strikingly different in general appearance that it seems difficult to regard the two specimens as belonging to but one species, but long series taken by Mr. Brown at Cue and Ankertell (including many taken *in cop.*) leave no doubt of this being the case. On the third interstice there are from two to five very obtuse tubercles, on some specimens tending to become subcarinate towards the base; on the seventh interstice the tubercles are much less conspicuous than on the male and are usually but two in number (on the latero-apical slope), and even these are not always distinctly conical; on an occasional specimen there are some feebly tuberculate spaces on the fifth interstice.

The type of *frenchi* (fig. 114) is a large female of the species, with the derm having a glazed appearance and the punctures more clearly outlined than on any other specimen under examination.

The type of *rudis* (fig. 111) is another large female, with the punctures less sharply defined, although still of large size, and more frequently confluent than usual. The base of the elytra is certainly different in shape to that of the type of *frenchi*, but the differences appear to be of an individual nature rather than specific.

LEPTOPS CLAVUS, Fab. (formerly HIPPORHINUS).

L. elegans, Lea.

Mr. Arrow informs me that *elegans* is a synonym of *clavus* (from comparison with the type of the latter). This being the case, it would appear that the subfamily *Hipporhinides* must be altogether removed from the lists of Australian beetles, as the only other species (*nigrospinosus*, No. 4940) standing under the subfamily in Masters' Catalogue belongs to the *Amycterides*.

LEPTOPS EBENINUS, Pasc.

L. crassicornis, Pasc.

Mr. Arrow sent for examination a specimen of *crassicornis* that appeared to represent a variety only of *ebeninus*, and on his attention being called to this, he wrote:—"The types of *ebeninus* and *crassicornis* differ little, and seem to me to be certainly conspecific." Later on he sent two specimens of the latter and three of the former, including a co-type of each with a label in Pascoe's writing. On *ebeninus* the tubercles are more conspicuously conical than they are on *crassicornis*, on whose elytra they are usually rounded and fewer in number; but they belong to one species and to a small group [12] all of whose species are variable.

LEPTOPS RETUSUS, Pasc.

L. rostralis, Lea.

The description of *retusus* is quite misleading; the species is a very distinct one, and has been redescribed under the name of *rostralis*. On Mr. Arrow informing me of this, three questions as to the type were asked, as follows:—1. Is there a small tubercle [13] on each side of the elytra just above the middle of the metasternum? 2. Is there a curious

[12] E, of the table in Ann. Soc. Ent. Belge, 1906, p. 315.

[13] C, of the table, *l.c.*

oblique swelling just in front of each eye? 3. Are the large elytral tubercles in the same positions as the specimen sent of *rostralis?* As affirmative answers were given to all, there is no doubt but that the names are synonymous.

LEPTOPS HYPOCRITUS, Pasc.

A co-type, sent for examination by Mr. Arrow, has clothing not at all green, the prothorax with a feeble median (not subbasal) carina, with two distinct transverse interrupted impressions; each elytra with three undulated (scarcely subtuberculate) ridges, of which one commences on the shoulder as an obtuse tubercle. The rostrum was described as "in medio canaliculato," the middle of that of the co-type seems to be narrowly impressed near the base, but near the apex it appears to be feebly carinated; regarding it as non-carinated it would in my table [14] be placed with *setosus*, with which it has scarcely anything in common; regarding it as carinated it would be placed in L, from all the species of which it is at once distinguished by having but the humeral tubercles. Probably, however, the male possesses characters that would cause it to be referred to a different section. Quite certainly it is not the species I incorrectly had as *hypocritus*, and so commented upon. [15]

LEPTOPS ACUTISPINIS, Pasc.

A very distinct species, the original description, however, is not quite accurate (judging by a co-type on loan from the British Museum), as the rostrum is described as "robust, a slender somewhat abbreviated carina in front"; whereas it is comparatively thin and has a median carina traceable from the base almost to the apical triangle.

LEPTOPS POLYACANTHUS, Pasc.

A specimen from Cunnamulla appears to belong to this species, but has the elytral tubercles more acute than usual and the inter-ocular elevations very feeble instead of strongly pronounced.

LEPTOPS FASCICULATUS, Lea, var. PULCHRIPENNIS, n. var.

In the Cairns district I obtained numerous specimens that appear to represent a variety of *fasciculatus;* they differ from the typical form in having the elytra non-fasciculate, or at least with the fascicles so reduced as to be little more

[14] Ann. Soc. Ent. Belge, 1906, p. 316.
[15] *Ante*, 1914, p. 296.

than feeble clusters of setae, and not supported by tubercular swellings. To the naked eye the elytra have a spotted appearance, but this is due to small patches of golden scales: the patches on some specimens are brilliantly golden, or greenish-golden, but on others are whitish with a slight golden gloss, and the amount of surface they cover varies considerably; the scales among which they are set are sooty-brown or black, but on the apical slope the scales are entirely dark. Many other parts of the body and appendages are also supplied with golden scales, but without the spotted appearance of the elytra. In some lights each elytral puncture appears to have a small shining granule on each side, but with greasy or abraded specimens these tend to disappear: on such specimens also the golden patches diminish in size and brilliance. The granules are occasionally traceable on the typical form, but not on *fasciatus*, which species the variety approaches in sculpture, although at present I cannot look upon that species as a variety of *fasciculatus*. Two other specimens have the scales on the upper-surface entirely golden, with a purplish tinge; on another the scales are white, with a golden or purplish tinge, becoming greenish on the sides.

LEPTOPS VACILLANS, Lea.

The types of this species were supposed to be from Queensland, but there were two specimens of the species in the Blackburn Collection labelled as from Western Australia.

LEPTOPS GLOBICOLLIS, Lea.

Numerous specimens from Dalby differ from the type of this species in being larger (up to 20 mm.) and with all the joints of the funicle longer than wide.

LEPTOPS CONTRARIUS, Blackb.

Pl. xxxviii., figs. 127 to 132.

In general appearance many specimens of this species are extremely close to the variety *carinatus* of *duponti;* but the suddenly terminated intermediate carinae of rostrum are distinctive. Like so many of the species with armed breast it is very variable in length (16 to 33 mm.) and as to the tubercles and carinae of the elytra. Mr. Brown has taken numerous specimens at Cue.

LEPTOPS COLOSSUS, Pasc.

Pl. xxxviii., figs. 135 to 137.

The white scales on this species with age tend to become of a muddy-brown, especially on specimens at all greasy.

Leptops echidna, W. S. Macl.

Pl. xxxviii., figs. 138 to 140.

On the males of this species the first row of elytral tubercles is sometimes continued almost to the base, instead of degenerating into a carina there; in the females it is sometimes represented by two or three tubercles about the apical slope, and carinated thence to base. In both sexes the prothorax appears to be invariably largely scooped out on the disc (the middle usually but not always carinated) and the sides are conspicuously dilated from base to near apex. There are numerous specimens (ranging from 18 to 28 mm.) in the Museum from Eyre Sand Patch; but the species also ranges down to 11 mm.; see the following note.

Leptops acerbus, Pasc.

Pl. xxxviii., figs. 133 and 134.

I have previously (Ann. Soc. Ent. Belge, 1906, p. 323) commented upon two forms, either of which might be *acerbus;* of these a specimen from Champion Bay is figured at 134 on plate xxxviii., and there are others from Beverley before me quite as small (down to 11 mm.). I am now quite satisfied that these are varieties of *echidna;* but the specimen without exact locality (fig. 133) is certainly not *echidna*.

Leptops biordinatus, Blackb.

Pl. xxxvi., figs. 95 to 104.

Superficially some males of this species strongly approach some males of *duponti*, but the suddenly terminated intermediate carinae of rostrum are at once distinctive. On an occasional specimen the third interstice on each elytron is carinated from base to about summit of apical slope, so that at first glance there is considerable resemblance to some specimens of *interioris;* on one specimen the second and fourth interstices appear like closely-set chains of small beads, the tubercles (or granules) being twice as numerous as on the typical form. A large specimen from Eucla is most certainly without a pair of conjoined tubercles [16] on the suture near summit of apical slope, nevertheless there is at the position where these should be two minute flattened shining spaces that appear to represent remnants of tubercles.

Hab.—Port Pirie, Fowler and Murat Bays, Gawler Range, Wilmington.

[16] They are decidedly variable in size on the species.

LEPTOPS GRAVIS, Blackb.

Pl. xxxvi., figs. 105 to 110.

Except by the intermediate carinae of the rostrum gradually running into the head, instead of abruptly terminated, it is difficult to distinguish some females of this species from females of *biordinatus*. At Cooper Creek the natives' name for the species (according to the late Dr. J. G. Reuther) is "Warnkati."

LEPTOPS FRONTALIS, Blackb.

A specimen from Stapleton (Northern Territory) differs from the normal form of this species in having the humeral tubercle on each elytron reduced almost to the vanishing point.

LEPTOPS ELONGATUS, Lea.

Pl. xxxix., figs. 143 to 145.

Mr. Brown took numerous specimens (there are now nine before me) that I hesitate to regard as more than a variety of *elongatus;* they all differ in having the elytral tubercles more obtuse, on the apical slope they are more prominent than the others, but much less acute than those of the type; the median channel of the pronotum is much less conspicuous (not due solely to clothing), less parallel-sided, and on five of the specimens an obtuse ridge traverses its middle, so that on each of these it appears as two irregular foveae. The median and sublateral carinae of the rostrum are narrower than on the type, although the same in direction and bounded by similar grooves; the sixth joint of the funicle is transverse, and the other joints are slightly shorter than on the type. The clothing is more of a snowy whiteness (on the type the darker colour may be due to age), and on the abdomen, to the naked eye, appears to form three stripes, of which the median one is abbreviated, its place on the apical segment being taken by a subtriangular shining space; on each of the nine specimens this space is very distinct, although sparsely clothed, on the type it is scarcely traceable owing to being rather densely clothed, on the type also the larger scales are much more numerous on the under-surface generally. Seven of the specimens are from 14 to 16 mm. in length, the others are much larger, 21 to 23 mm.

LEPTOPS HERCULES, Lea.

Pl. xxxviii., figs. 141 and 142.

The male of this species differs from the female (the only sex described) in being much narrower, considerably smaller, prothorax slightly longer than wide, elytra with more acutely

conical tubercles on apical slope and punctures (except on sides) less well defined owing to the greater elevation of the interstices. The only male I have seen differs also in having the prothorax without a median carina and the scutellum not elevated, but these may be individual variations. It is evidently abraded, and has numerous minute denticulations showing on the front tibiae.

LEPTOPS HORRIDUS, Lea.

A specimen from the Coen River differs from the typical form of this species in being much smaller (11 mm.) and narrower, with the elytral tubercles conspicuously red and more acute; the *Catasarcus*-like tubercle on each side, moreover, is much smaller than usual, although traceable.

LEPTOPS LATICOLLIS, Lea.

Mr. G. F. Hill has taken numerous specimens of this species near Darwin, and sent six for examination. These all have the upper-surface apparently glabrous, but really sparsely clothed with short setae. The female differs from the male in having the elytra considerably wider than the prothorax, and with somewhat shorter legs.

LEPTOPS PARVICORNIS, Lea.

Plate xxxix., figs. 146 to 148.

Three specimens were photographed to show the differences in size and appearance of this rare species.

LEPTOPS CACOZELUS, Lea.

Pl. xxxix., figs. 154 and 155.

A specimen from Tarcoola evidently belongs to this species, but has two small conjoined tubercles on the suture near the summit of the apical slope; on another remnants of tubercles are traceable; these specimens seem almost to connect the species with *parvicornis*.

LEPTOPS CRASSIROSTRIS, Lea.

A specimen from Dr. Ferguson, without locality label, may belong to this singular species; but it differs from the type in having the elytra less suddenly elevated at the base, with six small tubercles there, some obtuse but fairly large ones on the third and fifth interstices, and the punctures larger; on the prothorax also the granules are larger and better defined. From *phymatodis* it differs in the rostrum being much shorter, the elytral tubercles much smaller, and the base of elytra very different.

LEPTOPS AMPLIPENNIS, Lea.

Pl. xxxv., fig. 90.

The figure given is that of the only specimen I have seen of this species.

LEPTOPS MURICATUS, Pasc.

Pl. xxxv., figs. 91 and 92.

In the genus *Leptops* there are very few species that closely resemble each other and yet may be distinguished by strong differential characters; but there are two species before me either of which might be *muricatus* by the description, which strongly resemble each other and yet are certainly distinct. One of these is described as new under the name of *browni*, the other I previously tabulated as *muricatus;* the latter has a small but distinct *Catasarcus*-like tubercle on each elytron, the median carina of the rostrum is not abruptly terminated, but vanishes level with the parts about the base of the rostrum, and behind it there is a shallow groove, quite disconnected with the grooves on each side of the median carina, characters strongly at variance with *browni;* there is a feeble and very obtuse swelling in front of each front coxa, but this is very different to the conspicuous conical or subconical tubercle of *browni*. As it is a widely-distributed species, and occurs on the coast of Western Australia (the type was from Nicol Bay), it is much more likely to be the true *muricatus* than *browni*, which so far has only been taken in the dry interior by Mr. Brown

LEPTOPS DUBOULAYI, Pasc.

Pl. xxxix., figs. 151 to 153.

A very fine species, varying in some directions towards *colossus*, and in others towards *hercules*, but quite distinct from both.

LEPTOPS HORNI, Blackb.

Two specimens from Derby may represent a variety of this species; they differ from the description and from some typical specimens in being much larger (15-18 mm.), with one pair only of conjoined tubercles on the suture, and that pair comparatively smaller, the median groove of the prothorax is also more pronounced and regular.

LEPTOPS PALMENSIS, Blackb.

In the 1906 table of the genus a co-type [17] of this species would be asociated with *horni*, from which it differs in the

[17] In the National Museum, Melbourne.

elytra having fewer tubercles, prothoracic sculpture less vermiculate, and scape stouter. The expression "tuberculis subobsoletis" and "the alternate elytral interstices are . . . obscurely knobby rather than distinctly tuberculate," would be deceiving if applied to the co-type (although, no doubt, correct for the type), as from it tubercles (except those on and about the apical slope) and knobs are entirely absent, the alternate interstices being feebly waved only.

LEPTOPS SCULPTUS, Blackb.

A single specimen from the North-west of South Australia (H. Basedow) probably belongs to this species; it differs, however, in being much smaller than the type (9 as against 14 lines),[18] but in all other respects it agrees with the description.

LEPTOPS NITIDIVENTRIS, n. sp.

Pl. xxxv., figs. 79 to 86.

♂. Black. Densely clothed on legs and on depressed parts with small round whitish or greyish scales, closely applied to derm; antennae and legs with numerous setae.

Rostrum with intermediate carinae strongly elevated, dilated at base, and suddenly terminated there, median carina rather feeble and short; sublateral sulci narrow and deep in front, dilated to near base, and then narrowed; scrobes wide and deep at base, suddenly curved upwards so as to margin the eyes. Antennae not very long; first joint of funicle slightly longer than second, none of the others transverse. *Prothorax* rather long, and roughly sculptured. *Scutellum* very small. *Elytra* long, at widest not twice the width of prothorax; with subgeminate rows of large punctures, more or less interrupted by elevations; third, fifth, and seventh interstices with conspicuous rows of tubercles, commencing as obtuse elevations near the base and becoming larger and conical posteriorly. *Prosternum* with a conspicuous tubercle in front of each coxa, and a semi-double one in middle of base. *Abdomen* highly polished except at sides. *Legs* long; tibiae not denticulate. Length, excluding rostrum (♂, ♀), 25-35 mm.

♀. Differs in being larger, with much wider elytra (especially posteriorly), longitudinal elevations of prothorax less abrupt, tubercles more numerous and obtuse, and appendages shorter.

[18] Much less than the range of variation of the allied *contrarius*.

Hab.—Western Australia: Ankertell, Lake Austin, Cue (H. W. Brown). Type, I. 5386.

A very fine species, taken in abundance by Mr. Brown. In the 1906 [19] table of the genus it would be associated with *colossus*, but it is not at all close in appearance to that species, and in neither sex are the third and fifth interstices carinate. It is readily distinguished from *areolatus* by the abruptly terminated rostral carinae and highly-polished abdomen; the latter character is rare, but not unique in the genus. Owing to the rows of granules on the elytra and to the four linear elevations on the prothorax the clothing on some specimens has a vaguely striped appearance. The prothorax by actual measurement at its widest part is slightly wider than long, but to the naked eye it appears to be slightly longer than wide; it has a wide median excavation, bounded by vermiculate elevations, meeting in front but not behind; along the middle there is usually a narrow irregular carina, but this is sometimes split up into two parts, and occasionally is absent, the sides are bounded by irregular elevations consisting of subconjoined granules and tubercles, on each side of which are numerous small polished tubercles. The row of tubercles on the third interstice is much more conspicuous than the others (although the tubercle at the junction of the fifth and seventh rows is the largest of all), the seventh row commences with a small subconical one on the shoulder, the fifth commences some distance from the base. Seen directly from behind, the major portion of the apical slope is bounded by the six largest tubercles—two on the third interstices (approaching but not meeting on the suture), two at the junctions of the fifth and seventh interstices, and two where these connect with the third (near the apex); similar tubercles are on several of the other large species, but all of these have the abdomen very different. Between the middle coxae there are two processes, [20] a short one attached to the metasternum and a longer sloping one forming part of the metasternum (these are quite readily seen to be separate processes, and although they do not appear to have been previously commented upon, are present, although not always exactly the same, on every species of the genus, although usually obscured by the clothing), the semi-double tubercle behind the front coxae is present on some others of the large species; the front of the prosternum is widely excavated for the reception of the base of the head.

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[19] Ann. Soc. Ent. Belge, pp. 314-316.

[20] These do not come out very clearly on fig. 86.

LEPTOPS PILULIFER, n. sp.

Pl. xxxv., figs. 87 to 89 and 93 and 94.

Black. Depressed parts, antennae and legs densely clothed with whitish or ashen scales; in addition with stout setae.

Rostrum with three conspicuous carinae on upper-surface, gradually converging from the front to near the base, but not meeting there, owing to a deep inter-ocular fovea, which separates the intermediate ones (these evenly run out at the base), and in which the median one terminates; sublateral sulci rather narrow, open posteriorly; scrobes wide and deep, at base directed upwards along front margin of eyes. Antennae rather short; third to seventh joints of funicle transverse. *Prothorax* about as long as wide, roughly vermiculate-tuberculate, with a rather narrow median groove. Scutellum very small. *Elytra* elongate-ovate, at widest (about the middle) fully twice as wide as prothorax; with rather large and irregular, but not very deep, punctures; suture with two small conjoined tubercles near summit of apical slope, and remnants of others before same; third, fifth, and seventh interstices with numerous tubercles, the others sometimes with tubercles (but smaller ones). *Prosternum* distinctly armed. *Legs* moderately long; tibiae feebly denticulate. Length, 28-30 mm.

Hab.—Western Australia: Mullewa (Miss J. F. May and W. D. Dodd), Yalgoo (H. W. Brown). Type, I. 5388.

In the 1906 table of the genus would be associated with *gravis*, but the elytral tubercles are different; a few of them (on the apical slope) are subconical, the others are all rounded (knob-like), and these, together with short connecting intervals, give the elytra an appearance as of being supplied with strings of beads—fairly large round ones, alternated with thinner cylindrical ones; the second, fourth, and sixth interstices are usually supplied with small tubercles or granules, but on some specimens appear simply as slightly-waved lines. The setae on the appendages are fairly dense, on the elytra they change to true scales, fairly thickly scattered about on the elevated parts, and a few amongst the ordinary scales; on the prothorax they are rather narrower. The median groove on the prothorax is more conspicuous on some specimens than on others, but this is due partly to clothing; along its middle there is usually a carina or remnants of same. The six specimens before me appear to be all females; two others (figs. 93 and 94) differ in having somewhat wider elytra, with more numerous tubercles, approaching some females of the preceding species, but the abdomen is roughly punctured and not highly polished.

LEPTOPS BROWNI, n. sp.

Pl. xxxvii., figs. 123 to 126.

♂. Black. Densely clothed on the depressed parts and on the appendages with soft white scales; upper-surface in addition with some larger scales scattered about; appendages (especially the tibiae and tarsi) rather densely setose.

Rostrum rather long; median carina very conspicuous, at base terminating in a large inter-ocular fovea; intermediate carinae rather narrow, somewhat dilated at base, but not suddenly terminated there; sublateral sulci narrow, open posteriorly; scrobes deep in front, rather shallow behind, where at base they are directed upwards to margin the eyes. *Prothorax* elongate, sides but feebly dilated in middle, roughly vermiculate, the middle with a conspicuous groove. *Elytra* elongate, at base not much wider than prothorax, but fully twice as wide about the middle; with large but frequently interrupted punctures; with numerous small conical or subconical tubercles, becoming larger and more acute on and about the apical slope. *Prosternum* with a distinct subconical tubercle on each side in front, and a semi-double one in middle of base. *Legs* rather long, tibiae with denticulations scarcely traceable through clothing. Length (♂, ♀), 21-33 mm.

♀. Differs in being larger, with much wider elytra; tubercles more numerous and obtuse, and legs somewhat shorter.

Hab.—Western Australia: Cue and Lake Austin (H. W. Brown). Type, I. 5387.

One of the finest species of the genus, and taken in fair numbers by Mr. Brown. In the 1906 table of the genus would be associated with *gravis*, with which, however, it has little in common. All the specimens differ from those previously (and, I believe, correctly) identified by me as *muricatus*, and which they strongly resemble in many respects, in having the median carina of the rostrum almost abruptly terminated, and beyond it a deep and fairly long groove (the termination of the groove on each side of the carina); the breast is always distinctly armed, and there is no *Catasarcus*-like tubercle or spine on each elytron, just above the middle of the metasternal episternum; they all have also a conspicuous median channel on the pronotum: this is rather narrow and parallel-sided on some specimens, but on others is somewhat dilated posteriorly, on the latter it is usually supplied with a median carina; it is densely clothed with snowy scales, and towards each side there is another but less distinct line of scales, in consequence the surface appears to be divided into four longitudinal vermiculate spaces—two wide median

ones and two considerably narrower lateral ones; on the female it usually appears to be divided into six longitudinal spaces. To the naked eye the extreme length of the prothorax appears to be considerably more than its extreme width, but their measurements are exactly the same. The suture has always two conjoined conical tubercles near summit of apical slope, but they vary considerably in size; there are usually also numerous smaller tubercles or granules on the suture towards the base; the tubercles are larger on the third, fifth, and seventh interstices than on the others, but on the basal half are small, although sometimes acute; about the summit of the apical slope, however, they are decidedly larger and very acute; on the second, fourth, and sixth interstices the tubercles are sometimes numerous and conical or subconical, but on many specimens they appear as rounded knobs, or as slight undulations; the eighth and ninth interstices are also sometimes supplied with a few small tubercles on the basal half. As with *nitidiventris*, the major portion of the apical slope is bounded by six of the largest tubercles on the elytra, but, in addition, on this species there are the sutural ones, and sometimes two smaller ones adjacent to them on the slope itself.

LEPTOPS NITIDICOLLIS, n. sp.

Pl. xxxix., figs. 149 and 150.

Black. Clothed with light-brown scales and stiff setae. *Head* with inter-ocular fovea very small. Rostrum stout, sculpture less deeply impressed than usual. Antennae rather short. *Prothorax* moderately transverse, comparatively smooth and shining, with a conspicuous median line; towards the sides vermiculately impressed, with small scattered punctures. *Elytra* subovate, with irregular subgeminate rows of punctures, suture with two small conjoined tubercles near summit of apical slope; third, fifth, and seventh interstices carinate and then tuberculate. *Prosternum* obtusely armed in front. *Abdomen* highly polished. *Legs* moderately long; tibiae not visibly denticulate. Length, 22-24 mm.

Hab.—Western Australia: (Blackburn's Collection), Killerberrin (C. French). Type, I. 5501.

There are three specimens, apparently females, before me. Their elytra are exactly as on many specimens of *interioris*, but the prothorax is very different, being (except for certain impressed lines) smooth, shining, and without granules or tubercles. The pectoral armature is obtuse, but the species is so obviously a member of the group with the breast armed that it should certainly be placed in that group; regarding it as such, it would, in the 1906 table, be associated

with *tribulus* (as there identified), but really *duponti*, from which and from all its varieties it is readily distinguished by the highly-polished abdomen and very different prothorax, the rostral sculpture also is different. Regarding the breast as unarmed, it would be associated with *horni*, with which it has scarcely anything in common. The clothing is irregularly distributed, the scales being very dense on the scutellum, elytra, base of head, antennae, and legs; the setae are dense on the apical slope of elytra, muzzle, antennae, and legs, and sparse elsewhere; the prothorax is fairly densely clothed about the base, but sparsely elsewhere, and such setae as are present do not project upwards, but are almost buried in the derm, in consequence the upper-surface has a softly-polished appearance, strikingly at variance with most species of the genus; the abdomen is highly polished and with but few setae. The inter-ocular fovea appears to be little more than a puncture of moderate size. The median carina of the rostrum appears as a wide obtuse elevation, scarcely separated from the intermediate ones (these being practically absent); the sublateral sulci are fairly deep, subcrescentic in shape, and closed at both ends; the scrobes are wide and shallow posteriorly. From above the second joint of funicle appears to be slightly longer than the first, but from the side it is seen to be slightly shorter. Some of the elytral punctures are quite round, but the majority are separated by very irregular zig-zag or vermiculate lines. The carina on the third interstice is continued to beyond the middle, and is then broken up into from two to four small tubercles; on the fifth interstice the carina on two specimens is shorter and posteriorly broken up into feeble tubercles, but on one specimen it is continued as a feeble regular elevation till it vanishes; on the seventh interstice the carina is short and posteriorly is represented by from ten to twelve small tubercles; all the tubercles are small, but the most conspicuous ones are those on and about the apical slope.

LEPTOPS INSULARIS, n. sp.

Black. Densely clothed with pale scales and setae.

Head with inter-ocular fovea narrow and rather deep, but almost concealed before abrasion. Rostrum not very long; median carina narrow and acutely elevated, the intermediate ones rather less acutely elevated; sublateral sulci rather narrow, somewhat dilated, and open posteriorly. Antennae moderately thin; second joint of funicle somewhat longer than the first, none of the others transverse. *Prothorax* lightly transverse, sides evenly rounded, surface vermiculate-rugose. *Elytra* briefly subovate, at widest fully

twice the width of prothorax; with geminate rows of large punctures, appearing much smaller through clothing; third, fifth, and seventh insterstices gently elevated, the third at base dilated and produced on to base of prothorax. *Legs* rather long; tibiae lightly denticulate. Length, 11-14 mm.

Hab.—North-western Australia: Baudin Island (British Museum and Blackburn's Collection, from J. J. Walker), De Freycinet and Condillac Islands (British Museum). Type, I. 5652.

A non-tuberculate species that in the 1906 table of the genus would be associated with *regularis*, from which it differs in the comparatively much wider and very differently clothed and punctured elytra, etc. In some respects it seemed to agree with the description of *Onesorus obesus*, but it differs very considerably from a specimen of that species sent by Mr. Arrow for examination. Structurally it is close to *hirsutus*, but the clothing is very different. The scales are small and round, and on the head, prothorax, under-surface, and legs are white (on some specimens snowy-white, but with a faint silvery gloss); the pronotum appears to have three vague dark stripes, but this is due to the scales there being sparser than elsewhere; on the elytra the clothing is stramineous, the setae are dense on the appendages, moderately dense on the head and prothorax, and again dense on the elytra, where they are rather stouter than elsewhere, but do not project upwards, being curved over with their tips almost touching the scales, or actually concealed by them. The second joint of the funicle, even from the side, is seen to be distinctly longer than the first. The clothing of the prothorax partially conceals the sculpture, so that it appears through the scales to be supplied with numerous small granules; but on abrasion very few of these are seen to be isolated; on abrasion also a small medio-frontal depression (scarcely traceable before) becomes distinct. The female is larger and wider than the male, with somewhat shorter legs.

Leptops variegatus, n. sp.

Black. Very densely clothed with soft round scales and with numerous setae.

Rostrum unusually short, with a narrow median groove; scrobes rather narrow and deep, posteriorly directed below eyes. Scape short and stout, dilated to apex; first joint of funicle distinctly longer than second, none of the others transverse. *Prothorax* subcylindrical, sides feebly rounded, surface vermiculate-rugose. *Elytra* suddenly much wider than prothorax, almost parallel-sided to near apex; with regular rows of partially-concealed punctures; interstices

regularly elevated, but the even ones slightly wider than the odd ones. *Legs* not very long; denticulations of tibiae scarcely traceable through clothing. Length, 13 mm.

Hab.—Western Australia: Cue (H. W. Brown). Type (unique), I. 5655.

A non-tuberculate species, with very short rostrum and curious elytral bristles; it would be placed in A in the 1906 table of the genus, but it is not at all close to any species of that group. On the scutellum, under-surface, and legs the scales are whitish and usually with a faint golden gloss; on the upper-surface they are mostly fawn-coloured or light-brown; on the head there are two smoky spots at the base; on the elytra there are some small, irregularly-distributed spots of jet-black scales, on the sides there are some white scales, and on each elytron two oblong snowy spots about the middle, on the third and fifth interstices. On the elytra the setae are at almost right angles to the derm, long, stiff, and coloured the same as the scales amongst which they are set; on the head and prothorax the scales are much shorter. The space on each side of the rostrum, between the scrobe and the median groove, is narrow at the antenna and very much wider at the base, and has a fairly conspicuous oblique groove; this, however, is not the sublateral sulcus, which is very indistinct and between it and the scrobe. The type being unique and in perfect condition it was not abraded to make sure of the finer sculpture; on close examination the majority of scales on the elytra present an appearance as of grains of maize on a cob, the white scales are of similar size, but the black ones are slightly smaller and resemble jet-black beads.

LEPTOPS INERMIS, n. sp.

Black, some parts obscurely brownish. Densely clothed with soft round scales and with numerous setae.

Head with a narrow inter-ocular fovea. Eyes rather more convex than usual. Rostrum not very long, sides rather strongly incurved to middle. Antennae comparatively long and thin; second joint of funicle distinctly longer than first. *Prothorax* lightly transverse, sides moderately rounded, median line somewhat obscure; about middle granulate-punctate, towards sides vermiculate. *Elytra* cordate-ovate, greatest width almost twice that of prothorax; with geminate rows of large, regular punctures; third, fifth, and seventh interstices, and the suture posteriorly, gently elevated. *Legs* rather long; front tibiae conspicuously denticulate, the others less noticeably so. Length, 9-10 mm.

Hab.—Northern Territory: Batchelor (G. F. Hill). Type, I. 5651.

Belongs to A of the 1906 table of the genus. The scales are really very different to those of *glaucus*, but apart from these it differs from that species in being smaller, rostrum somewhat shorter, scrobes very different, alternate interstices of elytra less conspicuously elevated, and punctures, etc., different. Its general appearance is somewhat like that of *orthodoxus* or *fraterculus*, but the elytra are completely devoid of tubercles. On one specimen the legs and elytra are obscurely diluted with red, on the other they are almost or quite black. The scales vary on the two specimens, on one being almost entirely of various shades of pale golden-green; on the other, on the upper-surface, most of the scales are pale stramineous-brown, but on its under-surface and legs many of its scales are more or less golden-green or golden. The setae are long and thin on the muzzle, legs, and under-surface, rather sparse and stout on the prothorax, and fairly stout but not conspicuous on the elytra, where they are fairly numerous on the even and sparse on the odd interstices. The sculpture of the upper-surface of the rostrum is almost concealed by the clothing; a narrow median carina is distinct, but between this and the scrobes the surface appears to be irregularly punctate or granulate and without any conspicuous ridges or grooves; the scrobes are very shallow posteriorly, dilated there, and almost touch the lower-half of the eyes.

LEPTOPS SUTURALIS, n. sp.

Black. Very densely clothed with pale-ashen scales, interspersed with numerous stout but not very conspicuous setae.

Head with an obtuse swelling near each eye; inter-ocular fovea long and deep. Rostrum short and stout, median carina conspicuous from inter-ocular fovea to apical plate; sublateral sulci short, deep, and closed by the obtuse swellings on head; scrobes deep and sinuous, turned upwards alongside of eyes. Antennae short and stout; first joint of funicle about as long as second and third combined, second to seventh all distinctly transverse. *Prothorax* almost as long as wide; surface roughly vermiculate, with an interrupted median groove. *Elytra* elliptic-ovate, base truncate; with rows of large, partially-concealed punctures, regular only on sides; suture, third, fifth, and seventh interstices tuberculate. Length, 12-15 mm.

Hab.—Western Australia: Cue (H. W. Brown); Northern Territory: Barrow Creek (F. R. W. Scott). Type, I. 5536.

Regarding the head as tuberculate, this species, in the 1906 table of the genus, would be associated with *concaviceps*,

but the rostrum is very different; regarding the head as non-tuberculate, it would be associated with *horni*, also with the rostrum very different. The elytra are much like those of *musimon*, but on that species the cephalic tubercles are much larger and curved, and the intermediate carinae, sublateral sulci, and scrobes are all very different. On each elytron there are some small post-median tubercles on the suture (varying in number from two to five), the larger of which are about the summit of the apical slope; on the third and fifth interstices the tubercles commence at the extreme base (but the basal ones are small); on the seventh they commence near, but not at, the base; altogether there are between twenty-five and thirty on each elytron.

LEPTOPS LONGIPES, n. sp.

Black, parts of legs obscurely diluted with red. Densely clothed with whitish mixed with ashen scales; elytra with numerous short, thin setae, slightly longer on the apical slope than towards the base, denser on legs than elsewhere.

Head with a long, but apparently rather shallow, interocular fovea. Rostrum not very long, sides feebly incurved to middle; median carina (if present) not traceable through clothing, sublateral sulci rather deep and narrow; scrobes rather shallow posteriorly, directed towards lower edge of eyes, but then directed upwards. Antennae rather short; first joint of funicle distinctly longer than second. *Prothorax* not very wide, sides irregularly rounded, feebly depressed along middle, elsewhere with low vermiculate elevations. *Elytra* elongate-ovate, or elliptic; punctures more or less concealed, but evidently of moderate size; with numerous small tubercles. *Legs* rather long; front tibiae not visibly denticulate; claw-joint unusually long. Length, 16 mm.

Hab.—South Australia: Port Augusta (Blackburn's Collection). Type (unique), I. 5535.

In general appearance somewhat like *suturalis*, but with the head and rostrum very different. In the 1906 table of the genus it would be associated with *horni*, from which it differs in being considerably larger, median carina of rostrum scarcely traceable, prothorax much smoother, elytra with more numerous tubercles, but of which there are not two conspicuously larger ones on the suture about summit of apical slope. The setae on the supper-surface, although short, are decidedly thin; on the tarsi and on the undersurface of the tibiae they are much longer, almost hair-like, in fact. There is a greenish lustre on some scales of the antennae and legs. The third, fifth, and seventh interstices

have numerous small but distinct tubercles, the rows on the third and fifth terminate near summit of apical slope, the row on the seventh about the middle; in addition, there are numerous small but distinct ones on the suture, and a few still more obtuse ones on the basal third of the second interstice.

LEPTOPS LATIPENNIS, n. sp.

Black. Densely clothed with small, round, pale, muddy-brown (scarcely fawn-coloured) scales; upper-surface with very inconspicuous setae, but becoming dense and moderately long on abdomen and legs.

Head with inter-ocular fovea small and partly concealed. Rostrum moderately long; median carina distinct but feebly elevated, the grooves on each side feeble; sublateral sulci rather shallow and open posteriorly; scrobes comparatively narrow, at base directed upwards so as to margin the eyes. Antennae of moderate length; joints of the funicle more cylindrical than usual. *Prothorax* moderately transverse, sides irregularly rounded, with a rather large median excavation; surface roughly vermiculate-tuberculate. *Elytra* rather briefly ovate, across middle fully twice the width of prothorax; with numerous almost regular rows of rather large punctures; suture, third, fifth, seventh, and ninth interstices tuberculate, tubercles small, but many acutely conical. *Legs* rather long; tibiae rather strongly denticulate. Length, 13-15 mm.

Hab.—Australia (Old Collection); Northern Territory: Daly River (G. F. Hill). Type, I. 5520.

At first glance apparently a member of the group with armed prosternum, but the swellings in front of the front coxae are so extremely feeble that it would be wrong to treat them as armature; the species, therefore, in the 1906 table of the genus would be associated with *horni*, from which it differs in being considerably larger, rostrum longer and very differently sculptured at sides, and seventh interstice of elytra with a series of small but acute tubercles. In general appearance it is somewhat like large specimens of *cacozelus*, or small ones of *parvicornis*, but the intermediate carinae of rostrum are not suddenly terminated as on those species. A few of the scales have a golden lustre. The elytral setae are so few in number and so closely resemble the scales that at first they appear to be absent; even on the apical slope they are inconspicuous. There is a conspicuous pair of conjoined tubercles on the suture near apical slope, and a few feeble ones before same; on the third and fifth interstices the tubercles are largest (but not very large) posteriorly, on the seventh they are largest towards the base, the tubercles on the ninth are

very small; there are altogether from twenty to twenty-five on each elytron.

LEPTOPS FEROX, n. sp.

Black, antennae and tips of spines diluted with red. Rather sparsely clothed.

Head with inter-ocular fovea very shallow. Rostrum moderately long, upper-surface with five conspicuous carinae; scrobes deep in front, but vanishing before the middle. Antennae moderately long and thin. *Prothorax* moderately transverse, sides increasing in width from base to near apex and then suddenly narrowed to apex, with a wide median excavation bounded by irregular longitudinal elevations, between this and sides irregularly vermiculate. *Elytra* elongate-elliptic, with large punctures and large acute tubercles or spines; apex bimucronate. *Legs* long; tibiae scarcely visibly denticulate; claw-joint unusually long. Length, 12 mm.

Hab.—Northern Queensland (Blackburn's Collection). Type (unique), I. 5533.

In the 1906 table of the genus would be associated with *gladiator* and *laticollis*, from which it differs (besides in many other particulars) in the greater number of its tubercles. I know of no species closely resembling it in general appearance. The two large spines terminating the subsutural row almost meet at their bases, but nevertheless could hardly be regarded as "on" the suture; their position is practically that of the end ones on the third interstice, but that interstice, owing to the large size of the tubercles and the punctures is not easily made out. On the type, scales are dense only on the antennae, tibiae, and tarsi,[21] elsewhere they are decidedly scarce; on the legs, muzzle, and under-surface there are numerous pale setae; the inequalities of the elytra were filled with a reddish kind of greasy meal, but on soaking the specimen for some time in chloroform most of this disappeared. The five rostral carinae are of almost exactly the same length and elevation, and parallel almost throughout, the median one is joined to the apical plate, the two on each side are joined together in front, but not behind; in consequence the sublateral sulcus, which they margin, is very narrow and open posteriorly. The elytral punctures are large, but the rows are considerably affected by the tubercles; in turn, it is difficult to define the interstices the tubercles should be regarded as being on; those on each elytron are in

[21] Their presence there would appear to indicate that the other parts of the body and appendages have not been considerably abraded.

two conspicuous rows, commencing near the base and terminating near summit of apical slope, six in the inner and five in the outer row, of these the smallest is humeral; there is also a small but subconical tubercle half-way down the apical slope.

Polyphrades longipennis, Pasc.

This is an abundant and widely distributed species in South Australia, and varies considerably in size (6-11 mm.); its scales are usually ashen-grey, but vary to ashen-green, and even to ruddy-golden; the elytra with the fifth and seventh interstices conjoined posteriorly so as to become costate to apex, is its most distinctive (although not unique) feature.

Polyphrades rugulosus, Blackb., ♀.

Cherrus longulus, Blackb., ♂.

The types are in the South Australian Museum, and undoubtedly belong to but one species, of which *rugulosus* is the female and *longulus* the male, although the latter was referred to *Cherrus* on account of the rather long scape; of the same length, however, as in *rugulosus*, which was described as a "typical" *Polyphrades*. It belongs to a group of species that might be referred to either *Polyphrades* or *Cherrus;* but perhaps are preferably regarded as of the former. In addition to the type localities, specimens have been taken at Kalgoorlie and Boorabbin.

Polyphrades pictus, Blackb.

In his table of *Polyphrades*,[22] Blackburn distinguished *pictus* and *biplagiatus* from the other species by "head very conspicuously strigose longitudinally"—a character he did not mention in the description. In *biplagiatus*, even before abrasion, the head is seen to be quite strongly strigose; but on five co-types of *pictus* the striation was not conspicuous before abrasion, although where the scales were intentionally removed it was very evident.

Polyphrades rostralis, Blackb.

Two specimens from Paringa differ from some co-types of this species in having the clothing on the head and on the sides of prothorax and elytra metallic; on one specimen there are some brilliant green scales, forming a conspicuous line from apex of prothorax to apex of elytra, the scales between this line and the margins are more of an ashen-green. On the second specimen most of the scales are golden-green or

[22] Proc. Linn. Soc. N.S. Wales, 1893, pp. 282, 283.

golden, many on the sides being brilliantly metallic; on the upper part of its elytra, however, there are many obscure patches of chocolate-brown scales.

Polyphrades fortis, Blackb.

There are nine specimens before me (varying in length from 10 to 16 mm.) that evidently belong to this species, which appears to be a singularly easily abraded one, as six of them have the upper-surface almost entirely glabrous, on the elytra a few scales remaining only on the sides and apex. A specimen in perfect condition has the whole of the upper-surface closely covered with small round ashen scales, but with a slight metallic gloss in places; on the apical slope of its elytra there are some short setae (even these are missing from the other specimens), and the sides for the space of three interstices (as on the type) are densely clothed with pale scales. The other two specimens are too dirty for their clothing to be noted. The type was from Victoria, those before me from Murat and Streaky Bays and Norseman.

A specimen from Kuminin (Western Australia) probably also belongs to the species; its clothing is much as on the perfect specimen, but the five rostral carinae are much less conspicuously elevated and shorter (they vary, however, on the nine specimens), and many of the elytral punctures are transversely connected, the connecting depressions often extending across three or even more interstices; on two of the other specimens, however, there is an evident tendency to this structure, but on most of them the punctures are completely isolated.

Polyphrades uniformis, Lea.

Some specimens from Mullewa and Geraldton of this species are more conspicuously variegated than the types; they have three vaguely infuscated lines on the prothorax; on the elytra there are numerous patches of golden-red scales set amongst sooty-brown ones, on others the paler spots are of a dingy greyish-white. One specimen from Coolgardie at first glance appears to have very dingy scales on the elytra, but on close examination they are seen to be of a beautiful golden-rose colour on the upper-surface, changing to pale golden-green on the sides.

Polyphrades latus, Lea.

Four specimens from the Stewart River (Queensland) differ from the types in being much smaller (4-5 mm.).

Polyphrades granicollis, Lea.

Some specimens of this species (from Mount Lofty and Port Lincoln) are very small (ranging down to 3 mm.), and three of these from Mount Lofty have the elytral setae less depressed than usual; others are slightly larger than the types. In general appearance the species is fairly close to *pictus*, except that the average specimen is less brightly coloured, but on abrasion the head is seen to be non-strigose, except to a slight extent in the immediate vicinity of the eyes.

Polyphrades basalis, n. sp.

Black, appendages in parts obscurely diluted with red. Densely clothed with light-brown scales, paler on sides and about base of elytra than on disc, under-surface of body and of legs with white scales; with fairly numerous setae, becoming dense (but depressed) on elytra.

Rostrum very short and wide, on an almost even plane with head, and scarcely depressed and non-carinated along middle, inter-antennary space very wide; apical plate short, notched in front. Scape stout, short, and lightly curved; basal joint of funicle almost as long as second and third combined, fourth to seventh transverse. *Prothorax* almost twice as wide as long, sides gently rounded; with small dense granules, readily traceable before abrasion. *Elytra* subovate, sides rather strongly rounded, suddenly narrowed at base; with regular rows of large, deep punctures, appearing small through clothing. *Tibiae* lightly denticulate; claws not quite even. Length, 6-6½ mm.

Hab.—Northern Territory: Darwin (H. Wesselman). Type, I. 5591.

In general appearance fairly close to females of *basirostris*, but space between scrobes much greater, eyes less convex, and base of rostrum and of elytra different; the much wider space between the scrobes also distinguishes the species from *collaris* and *ampliatus*. On the front of the rostrum and on parts of the legs the scales have a more or less golden lustre; there are some small patches of sooty-brown scales on the sides of the elytra. From some directions the rostrum is seen to have a small glabrous triangle, but it is not conspicuously elevated above the adjacent parts and is not joined to a median carina; seen directly from in front or behind its triangular shape is not at all evident, whereas on most species the apical triangle is quite conspicuous from any point of view. The two specimens before me are probably females.

A specimen from East Kimberley (Inspector Stephens) appears to belong to this species, but differs in being smaller

($4\frac{3}{4}$ mm.), clothing entirely ashen, and elytral setae rather more conspicuous.

POLYPHRADES PLANIPENNIS, n. sp.

Black, parts of appendages very obscurely diluted with red. Densely clothed with ashen scales, darker on the upper-surface than on the under-surface; with dense setae.

Rostrum short and wide, on an even plane with front of head, with a narrow median line, inter-antennary space very wide and obliquely dilated to eyes; apical plate triangular and densely punctate. Scape stout; first joint of funicle as long as second and third combined, third to seventh transverse. *Prothorax* moderately transverse, sides strongly and evenly rounded; with small dense granules almost concealed before abrasion. *Elytra* very wide, more than half of their surface flat, base conjointly rather lightly arcuate, shoulders strongly rounded, widest near base; with rows of large, quadrate punctures, appearing much smaller, but in distinct striae, before abrasion. *Tibiae* finely denticulate; claws almost equal, separated for about half their length. Length, $6\frac{3}{4}$-7 mm.

Hab.—Northern Territory: Tennant Creek (J. F. Field). Type, I. 5809.

The very wide rostrum, not distinctly separated at base from head and very wide between the scrobes, strongly and evenly rounded sides of prothorax, and very wide elytra, will in combination readily distinguish this species from the other Northern Territory ones. Its general appearance is somewhat like that of *latus*, but the rostrum is very different. *Tumidulus*, which also has the rostrum and front of head on an even plane, is a strikingly different species. The setae are everywhere dense, on the prothorax they are mostly directed towards the middle, on the elytra, in conjunction with the dense clothing on the interstices, they give the surface a striped appearance. The discal portion of the elytra is unusually wide and flat.

POLYPHRADES DURIUSCULUS, n. sp.

Black, tarsi obscurely diluted with red. Densely clothed with muddy-brown scales, feebly variegated in places, and mixed with numerous stout setae.

Eyes almost circular and rather prominent. Rostrum rather short and wide, feebly depressed along middle, inter-antennary space conspicuously narrowed to middle, where the width is about equal to that of an eye; apical triangle distinctly elevated and punctate. Scape rather short, lightly curved; basal joint of funicle not very long, slightly longer

than second, second feebly, the others rather strongly transverse. *Prothorax* moderately transverse, sides moderately, base and apex lightly rounded; with dense round granules, very distinct after but not before abrasion. *Elytra* elongate-subcordate, not much wider than prothorax, widest about middle; with regular rows of large round punctures, appearing very small but in distinct striae before abrasion. *Legs* rather short and stout; claws short, equal, separated from about the middle. Length, 5 mm.

Hab.—Queensland: Cairns district (F. P. Dodd). Type (unique), I. 5810.

A rough-looking species, larger than *parvus*, inter-antennary space more narrowed posteriorly, antennae stouter, prothorax less rounded, and clothing rougher. Considerably narrower than *latus*, prothoracic granules not conspicuous before abrasion, and their setae stouter and more depressed; the elytral setae are also decidedly less numerous than on that species. The clothing is so dense that the inter-ocular sculpture is entirely concealed, but a small portion has been abraded near an eye, and is seen to be rather strongly obliquely strigose; the prothoracic granules are scarcely traceable through the clothing, although each is supplied with a stout seta. There are some feeble pale spots of scales at the base of elytra, between eyes, and on the legs, and still more feeble spots on the pronotum; the setae are stout, but all more or less decumbent.

Polyphrades maestus, n. sp.

♂. Black, parts of appendages obscurely diluted with red. Densely clothed with muddy-brown, feebly-variegated scales, becoming ashen on under-surface; moderately densely but rather inconspicuously setose.

Eyes rather large and ovate. Rostrum moderately long, tricarinate, median carina narrow and conspicuously joined to a conspicuous and almost impunctate apical triangle. Scape stout and almost straight; first joint of funicle slightly longer than second and third combined, second slightly longer than third, the following ones lightly transverse. *Prothorax* rather lightly transverse, sides moderately and evenly rounded; granules dense, round, and distinct before abrasion. *Elytra* moderately long, base conjointly lightly arcuate, widest at about basal third; with regular rows of large, suboblong punctures, appearing much smaller through clothing, but striation deep and distinct. *Legs* moderately long; tibiae distinctly denticulate; claws short, equal, and separated only near apex. Length (♂, ♀), 6½-8 mm.

♀. Differs in having wider elytra, basal segment of abdomen distinctly convex (instead of flat in middle), and appendages somewhat shorter.

Hab.—South Australia: Lucindale (B. A. Feuerhardt and A. M. Lea). Type, I. 5811.

Belongs to a group of closely-allied species, distinguishable mostly by characters of the rostrum and elytra. The intermediate carinae of the rostrum, which are partially concealed by the clothing, slightly converge towards the base; in *fulvus* they diverge towards the base; there are also slight differences in the base of elytra, in the clothing, etc. From *nanus* it differs in the base of prothorax and elytra, in the much sparser elytral setae, etc. *Pictus* has the inter-antennary space decidedly narrower, scape shorter and more curved, and elytral setae different. *Nitidilabris* is a somewhat wider species, with median carina of rostrum apparently absent and with dense elytral setae; on the present species the setae are never more than in three rows on an interstice, and in places are in but one or two, they are also more depressed and inconspicuous. Some of the scales on the under-surface and legs have a golden or rosy gloss, especially in the males. Seen directly from the side the rostrum appears to be depressed at its junction with the head, although without a conspicuously impresed line as on some species of the genus.

POLYPHRADES HALMATURINUS, n. sp.

♂. Black, appendages more or less red. Closely covered with obscurely mottled brown and ashen scales, becoming more or less metallic on under-surface; rather sparsely setose.

Eyes fairly large and ovate. Rostrum moderately long, tricarinate, the sublateral ones slightly converging hindwards but not extending to base, median one narrow and distinct, joined to a conspicuous apical triangle. Antennae comparatively thin; first joint of funicle as long as second and third combined, second as long as third and fourth combined, fourth to seventh transverse. *Prothorax* moderately transverse, sides strongly and evenly rounded; densely granulate and punctate. *Elytra* briefly subovate, sides strongly rounded and widest across basal third; with regular rows of large, subquadrate punctures, appearing small and in narrow striae through clothing. *Legs* moderately long; claws short, equal, and separated near the tip only. Length, $3\frac{1}{4}$-$3\frac{3}{4}$ mm.

♀. Differs in having the prothorax slightly longer, elytra distinctly wider, two basal segments of abdomen rather strongly convex (instead of the first flat in middle and the second gently convex), and the appendages shorter.

Hab.—South Australia: Kangaroo Island (J. G. O. Tepper). Type, I. 5812.

A small species, slightly larger than the average size of *laetus*, with slightly stouter antennae, and the inter-antennary space distinctly wider; the clothing is also not the same (although the markings of *laetus* are very variable). From very small specimens of *granicollis* it is distinguished by its narrower form, thinner antennae, and differently-sculptured prothorax. *Inconspicuus* is a more coarsely-sculptured species, with stouter and darker antennae, etc.; all the other small species differ from it in many respects. The scales on the upper-surface are mostly of a rather dingy-brown, obscurely mottled with ashen spots, but on some specimens many of the scales have a slight golden or golden-green gloss; on the under-surface most of the scales are golden or golden-green. At first glance the upper-surface appears to be without setae, but on close examination one or two irregular rows may be traced on each elytral interstice. The prothoracic granules are not conspicuous before abrasion, and even after the scales have been removed they are seen to be all more or less conjoined, with numerous intervening punctures. Where I have abraded the head it is seen to be sparsely punctate and non-striate.

Polyphrades macrops, n. sp.

Black, some parts obscurely diluted with red, appendages flavous, in parts lightly infuscated. Upper-surface densely clothed with scales, and with thin but suberect setae; under-surface almost glabrous.

Eyes unusually large and almost circular. Rostrum rather short and parallel-sided, inter-antennary space without traceable carinae, apical plate semi-circular. Scape comparatively long and thin, lightly curved; two basal joints of funicle moderately long, the first stout, third to seventh thin but transverse; club briefly ovate. *Prothorax* moderately transverse, sides strongly and evenly rounded, with dense granules traceable through clothing. *Elytra* distinctly wider than prothorax at base, sides feebly rounded to beyond the middle, and then strongly narrowed to apex, with regular rows of large punctures, appearing very small through clothing. *Femora* stout; claws notched at tip. Length, 2½ mm.

Hab.—South Australia: Mount Gambier; Tasmania: Hobart (A. M. Lea). Type, I. 5613.

In general appearance like a small *Mandalotus*, but claws soldered together except at the tip. The eyes are considerably larger (in proportion, fully twice as large as in *laetus*) than in any other described species of the genus, and this

character alone will readily distinguish it from all the others; they are almost perfectly circular in outline, but from above appear rather narrowly elliptic, and at the base are more than twice as far apart as at the apex. The scape is almost as long as the funicle and club combined. Both specimens at first appear to be uniformly covered with muddy-looking scales, but on the Mount Gambier specimen, in certain lights, many of them appear conspicuously golden or golden-red.

STENOCORYNUS LEPIDURUS, n. sp.

Black, appendages more or less obscurely reddish Irregularly clothed with more or less muddy-brown scales, on the legs mixed with numerous setae.

Head with small punctures between eyes; inter-ocular fovea suboblong and fairly large. Rostrum almost twice as long as wide, with a conspicuous median carina, on each side of which is a deep groove; sublateral sulci deep and subcrescentic in form. Scape about as long as four following joints combined; two basal joints of funicle rather long, none of the others transverse. *Prothorax* rather lightly transverse in male, widely so in female, with an irregular transverse subbasal impression; surface irregularly vermiculate; front margin conspicuously incurved behind each eye, and lightly in middle. *Scutellum* minute. *Elytra* not much wider than prothorax at base, sides dilated to beyond the middle; with somewhat irregular rows of large, round, deep punctures, a few about base transversely confluent; third interstice rather lightly elevated, sixth still more lightly. Length, 10-13 mm.

Hab.—Queensland: Coen River (W. D. Dodd and H. Hacker). Type, I. 5627.

On the pronotum and most of the elytra the clothing is rather sparse, but on the apical slope of the latter it is unusually dense, and this does not appear to be due to abrasion elsewhere, as it is alike on the three specimens before me (two of which were taken *in cop.* by Mr. Hacker). The eyes are narrower and the elytral punctures much coarser than on any other species of the genus.

ONESORUS CONIFER, Lea.

A specimen from Northern Queensland differs from the type in having the humeral tubercle less conspicuous, but otherwise agrees well with it.

ONESORUS ARMIPENNIS, n. sp.

Reddish-brown, in places almost black. Densely clothed with variegated scales, interspersed with numerous stout and more or less decumbent setae.

Head with an obtuse elevation close to each eye. Eyes elongate-ovate. Rostrum short and stout; median carina distinct in middle, commencing at a narrow inter-ocular fovea, and not joined to apical plate; sublateral sulci narrow and oblique, open in front but closed posteriorly. Antennae stout; scape about the length of four following joints; two basal joints of funicle moderately long and subequal, the four apical ones transverse. *Prothorax* strongly transverse; surface vermiculate and coarsely punctate; with a distinct median line. *Scutellum* absent. *Elytra* short, much wider than prothorax, with rows of very large punctures, appearing much smaller through clothing, especially posteriorly; fourth, seventh, and tenth interstices elevated, the tenth with a conspicuous, subconical, humeral tubercle. *Claws* distinctly but not widely separated from about their middle. Length, 8-9 mm.

Hab.—Queensland: Stewart River (W. D. Dodd). Type, I. 5650.

In general appearance somewhat like *Leptops frontalis*, but very different between the eyes and with the shoulders tuberculate. The claws are close together on their basal half, but could scarcely be considered to be soldered together as in *Zygmaus*. The colour of the derm is variable, and although on the two typical specimens is more or less reddish, on the variety noted below it is almost entirely black. The scales are mostly whitish, often with a silvery lustre, but change in places to a rather light-brown or slaty-grey, verging to ochreous: on each elytron, however, there is a conspicuous patch of black scales, commencing suddenly at about one-fourth from base and extending about half-way to the apex on the eighth and ninth interstices. The sculpture of the rostrum is distinct, although the clothing is dense; between each median groove and sublateral sulcus there is an elevation that commences rather widely at the subtubercular elevation and runs out to a sharp point, slightly in advance of the median carina; as a result, the rostrum across the middle has five conspicuously-elevated lines, at the extreme base two obtuse ones, and in front two obtuse ones. The elevated interstices on the elytra appear to be slightly undulating in height, but this is principally due to the alteration in colour of their clothing.

Another specimen from the Stewart River differs in being larger (12 mm.), clothing much dingier, elytra without the conspicuous black patches, setae rather longer and more numerous, and inter-ocular carina larger and wider, without an obtuse tubercle between it and each eye.

ONESORUS VERMICOLLIS, n. sp.

Black, some parts obscurely reddish. Densely clothed with scales of various shades of slaty-grey and brown, mixed with setae.

Head with an obtuse swelling near each eye. Eyes elongate-ovate. Rostrum stout; median carina rather feeble, but traceable from a rather narrow inter-ocular fovea to apical triangle; sublateral sulci slightly open in front, but closed posteriorly. Antennae stout; scape very little shorter than funicle; two basal joints of funicle moderately long and subequal, four apical joints transverse. *Prothorax* strongly transverse, with coarse vermiculate sculpture and large irregular punctures, median line rather feeble. *Scutellum* apparently absent. *Elytra* short and broad, with rows of very large punctures, appearing much smaller through clothing; fourth, seventh, and tenth interstices elevated, the fourth very conspicuously so about summit of apical slope. *Claws* free throughout. Length, 8 mm.

Hab.—Queensland: Coen River (W. D. Dodd). Type (unique), I. 5663.

In general appearance strikingly close to the preceding species, but with claws quite free and shoulders non-tuberculate. The scape is almost as long as the funicle, a character which will readily distinguish it from *pullatus*, in which it is no longer than the three basal joints of same. In *maculosus* the scape, although longer than on *pullatus*, is distinctly shorter than the funicle; that species also differs in having no joints of the funicle transverse, thinner and differently-sculptured rostrum, and prothorax with much smaller punctures. The clothing, as with other species of the genus, is probably variable; on the type the lower parts and legs are mostly clothed with paler scales, on the upper parts the scales are mostly of a rather dark-brown, becoming almost black in places, but on the elevated parts rather conspicuously variegated. The setae on the antennae and legs are dense and very distinct, but on the upper parts they are much sparser, stouter, and closely resemble the scales amongst which they are placed.

ONESORUS OCULARIS, n. sp.

Black, in parts more or less obscurely diluted with red, appendages almost entirely reddish. Densely clothed.

Head wide and gently convex between eyes; these very conspicuous. Rostrum wide, upper-surface flat and non-carinate, with a narrow median groove vaguely traceable on to front of head; sublateral sulci entirely absent; scrobes short, rather abruptly terminated. Scape about as long as

the four following joints combined; two basal joints of funicle moderately long, the second slightly longer than first, none of the others transverse. *Prothorax* fully twice as wide as the median length, sculpture partially concealed. *Elytra* briefly ovate, shoulders and sides strongly rounded, across middle fully twice the width of prothorax; with rows of large deep punctures close together, but appearing much smaller through clothing; fourth, seventh, and tenth interstices rather lightly elevated. Claw-joint long, with free claws. Length, 8-10 mm.

Hab.—North-western Australia (C. French), Derby (W. D. Dodd). Type, I. 5666.

The clothing appears to be variable, but is in perfect condition on only one of the four specimens before me: on that specimen it is mostly of a greyish-white, but on the upper parts of the elytra becoming of a mottled light-brown, the mottling more conspicuous on the elevated parts than elsewhere; the setae are dense, and distinct only on the tibiae and muzzle; on the second specimen the clothing is mostly of a dingy-brown, with two rather wide, vague, paler stripes on the elytra, extending from the base almost to the apex; on the third specimen the clothing is almost entirely of a dingy-white; the fourth specimen is very badly abraded. The eyes are very peculiar; when viewed from above they appear to be subangular in the middle; from the side the front edge is seen to be rounded and the hind one incurved, as a result the top portion is much wider than the other portions; the hind margin also appears to be carinated, but this is somewhat obscured before some of the clothing has been removed. On abrasion the head and rostrum are seen to be closely covered with punctures, those on the latter more or less obliquely confluent. The prothorax appears to be closely and irregularly punctate, but on abrasion is seen to be closely covered with net-like elevations, enclosing large irregular punctures. Three of the specimens have a small but distinct scutellum, but on the fourth it is not traceable.

Onesorus pullatus, n. sp.

Black, in places obscurely diluted with red. Densely clothed with somewhat variegated scales, mixed with setae, the latter stout and rather inconspicuous on upper-surface, but denser and longer on tibiae.

Head rather strongly convex between eyes; these briefly ovate. Rostrum short, sculpture more or less concealed by clothing. Scape stout, not as long as the three following joints combined; second joint of funicle slightly longer than

first, none of the others transverse. *Prothorax* almost twice as wide as the median length; surface with vermiculate but partially-concealed sculpture, median line distinct. *Scutellum* triangular and distinct. *Elytra* briefly ovate, shoulders and sides strongly rounded; with regular rows of very large punctures, appearing much smaller through clothing; fourth, seventh, and tenth interstices rather lightly elevated. *Claw-joint* long and thin and with free claws. Length, 6-8 mm.

Hab.—Northern Territory: Daly River (H. Wesselman). Type, I. 5664.

In general appearance somewhat like the preceding species, but with very different eyes and shorter scape; the latter is quite unusually short, being scarcely as long as the three basal joints of funicle combined. In general appearance it is fairly close to a Queensland species identified by Blackburn, with doubt, as *candidus*, but differs in having the prothorax and elytra much wider, the latter more abruptly increasing in width near the base, and with scape distinctly shorter. The clothing is not exactly the same on any two of the five specimens in the Museum; on the type it is mostly ashen-grey with a smoky spot behind each eye, three smoky longitudinal stripes on prothorax, the elytra irregularly spotted and striped with smoky-brown and stramineous, and the femora obscurely ringed; on the second specimen the darker spots and patches on the upper-surface are very confusedly arranged; on the three others the clothing is mostly of a uniform dingy-stramineous, with three obscure stripes on prothorax and three or four on elytra; on one of them the clothing on the suture is paler than on the adjacent parts; on the others the somewhat darker scales are not interrupted by the suture; the other stripe on each elytron is on the eighth and ninth interstices (and sometimes on part of the adjacent ones) for the greater portion of their length. To the naked eye (as on the type of the preceding species) some of the elevated parts have a regularly-spotted appearance. The apparent sculpture of the rostrum depends to a certain extent on the density of the scales; on the type it appears to be grooved and non-carinate along the middle, with the sublateral sulci fairly distinct; on another it appears feebly carinated along the middle, and with the sublateral sulci absent.

Onesorus albatus, n. sp.

Black, some parts of appendages obscurely diluted with red. Densely but irregularly clothed with snowy-white scales; the under-surface, appendages, and muzzle with rather dense setae.

Head rather strongly convex between eyes; these ovate. Rostrum rather long for the genus, with a conspicuous median carina from a rather feeble inter-ocular fovea to the feebly-defined apical triangle; sublateral sulci rather elongate and partially concealed; scrobes feebly sinuous, directed towards lower third of eyes. Antennae comparatively long and thin; scape about the length of five following joints combined; first joint of funicle slightly longer than second, the others gradually decreasing in length, but none transverse. *Prothorax* somewhat transverse, front margin somewhat sinuous; surface irregularly sculptured. *Elytra* briefly ovate, about twice the width of prothorax, surface very irregular. *Legs* comparatively long and thin; claw-joint long and thin, claws rather feebly separated from about the middle. Length, 10 mm.

Hab.—South Australia: Yunta (— Bunkitt). Type (unique), I. 5839.

The rostrum is longer than in other species of the genus, and but for the claws the present one probably would have been referred to *Leptops*. The type is possibly somewhat abraded, but probably not. The snowy scales on the under-surface, rostrum, and legs (except that in places the setae are denser than elsewhere) are dense and almost regular, on the prothorax they are dense on the sides and form an irregular stripe on each side of the middle; on the elytra they are dense in places, notably on the median third of the fourth interstice and on parts of the seventh, but in places they are very sparse or wanting; the elytra are without setae, except for a few on the apical slope. The sculpture of the prothorax appears to consist of irregular transverse or oblique elevations, each crowned with a row of punctures or granules, but where the scales are sparse the surface is very irregular. The scutellum appears to be absent. The elytra have somewhat irregular rows of large punctures, the majority of which are more or less obscured by scales, the suture is somewhat elevated posteriorly and has small granules throughout, and granules are rather numerous on the basal third; about the middle of each elytron there is a very irregular impression (these at first appear to be accidental, but as they are much alike on the two sides presumably they are normal).

Onesorus tarsalis, n. sp.

Reddish-castaneous, some parts darker. Clothed with snowy-white scales, on the legs mixed with dense fine setae.

Head gently convex between eyes, these rather briefly ovate; inter-ocular fovea narrow. Rostrum moderately long,

median carina rather feeble and inconspicuously joined to apical triangle; sublateral sulci partially concealed. Scape about the length of four following joints combined; first joint of funicle slightly shorter than second, none of the others transverse. *Prothorax* almost twice as wide as the median length, surface irregular and with two irregular transverse impressions. *Scutellum* absent. *Elytra* subovate, sides rather strongly rounded, with regular rows of large, deep punctures, partially concealed in places; fourth, seventh, and tenth interstices somewhat elevated. *Legs* comparatively long and thin; claw-joint unusually long and thin, claws conspicuously separated throughout. Length, 9 mm.

Hab.—Central Australia: Finke River (Captain S. A. White). Type (unique), I. 5840.

The claw-joint is thinner and about twice the length of that of *maculosus*, but there are many other differences. The type is probably somewhat abraded; on the under-surface, legs, and sides the scales are dense and uniform, except that in places some of them have a silvery lustre; on the prothorax they are condensed into four irregular stripes (causing an appearance as of three conspicuous dark intervening stripes), on the elytra they are very irregularly distributed, and the apical slope has a curious transversely spotted appearance.

Following is a table of the species known to me:—

A. Shoulders conspicuously armed.
  a. No joints of funicle transverse ... ... *conifer*
  aa. Some joints transverse ... ... *armipennis*
AA. Shoulders unarmed.
  B. Claws not separated throughout ... ... *albatus*
  BB. Claws separated throughout.
    C. Eyes apparently carinated ... ... *ocularis*
    CC. Eyes not carinated.
      D. Each elytron without three conspicuously elevated interstices.
        b. Hind tibiae with a few small but conspicuous teeth ... ... *hoplocnemus*
        bb. Hind tibiae at most minutely denticulate ... ... *squamosus*
      DD. Each elytron with three conspicuously elevated interstices.
        E. Three apical joints of funicle transverse ... ... *vermicollis*
        EE. No joints of funicle transverse.
          F. Scutellum distinct and occupying a basal notch in elytra ... *pullatus*
          FF. Scutellum indistinct and elytra without a notch for same.
            G. Fully three-fourths of front claw joint projecting beyond lobes of third ... ... *tarsalis*
            GG. Scarcely more than half projecting ... ... *maculosus*

I have only been able to include one of the original species in the table; of the others, I have seen a co-type of *obesus;* in size, shape, and general appearance it is fairly close to *squamosus*, but its elytral punctures are quite twice as large as those of that species.

O. tigrinus (from "Australia") is perhaps nearer *pullatus* than any other species, but the description of its elytral clothing and tibial setae are at variance with the five specimens of *pullatus* under examination.

O. candidus (also from "Australia") is very briefly described, but short as the description is I have seen nothing that will fit it; a Queensland species, close to *maculosus*, was doubtfully identified by the late Rev. T. Blackburn as *candidus*, but differs from the description in several particulars, and it was considered not advisable to include it in the table.

Aterpus foveipennis, Lea; var. bifoveifrons, n. var.

A recently-obtained specimen possibly represents a variety of this species. It differs from the type in being slightly larger (11 mm.), with the upper-surface (except for a few of the elytral foveae) quite as densely clothed as the under. Rostrum somewhat irregularly impressed in front. Prothorax with more conspicuous setae, punctures much smaller (at least, apparently so), and with a curious, small, shining, pear-shaped fovea on each side of the apex, immediately in a line with the middle of the eye. Elytra with third and fifth interstices much more distinctly elevated and nowhere subtuberculate.

Hab.—Queensland: Cairns district (A. M. Lea). Type of var., I. 2726.

Meripherellus nigriclavus, n. sp.

Chocolate-brown, rostrum, antennae (the club black) and legs (hind femora dark near, but not at, apex) flavous. With white scales between eyes, on prothorax, apex of elytra, and on under-surface.

Head with dense punctures. Eyes large, coarsely faceted, separated slightly more than half the width of base of rostrum. Rostrum moderately long, somewhat curved, dilated at apex; with rows of rather small punctures. Antennae thin, inserted about one-fifth from apex of rostrum; scape almost as long as funicle and club combined; first joint of funicle stouter and longer than second; club moderately long. *Prothorax* small, almost twice as wide as long, sides rather strongly rounded, base much wider than apex; with

dense punctures, in places concealed. *Elytra* scarcely once and one half as long as wide, much wider than prothorax, widest across shoulders, with rows of large punctures in rather deep striae; interstices each with a row of punctures. *Legs* long; femora stout, front lightly, middle moderately, hind strongly and acutely dentate; tibiae thin; front tarsi wide, flat, and fringed with long hairs; basal joint elongate-triangular, longer than the two following combined; second rather strongly dilated, with the apex notched; third cleft almost to base, with the lobes divergent; fourth rather small. Length, $1\frac{3}{4}$ mm.

Hab.—Northern Queensland (Blackburn's Collection). Type, I. 2727.

It was with some doubt that this species was referred to *Meripherellus*, as its front tarsi are very different to those of *apicalis*. They are, in fact, very peculiar, but may be sexually variable; the type appears to be a male. The white scales are as described, but the type shows traces of abrasion. From some directions parts of the elytral interstices appear to be ridged, so that there they appear to be much narrower than the seriate punctures.

Micraonychus rufimanus, n. sp.

Reddish-brown, in places almost black; most of rostrum, scape, part of funicle and tarsi more or less reddish. Moderately densely clothed with pale, greenish-blue or bluish-green scales, in places with a slight coppery gloss.

Rostrum long, thin, and shining; punctures concealed about base, near same small but distinct, elsewhere minute. *Prothorax* almost as long as wide, sides gently rounded, base not much wider than apex; punctures partially concealed. *Elytra* slightly wider than prothorax, sides very feebly decreasing in width from shoulders, with regular rows of large, clearly-defined punctures. Length, 2 mm.

Hab.—Northern Queensland (Blackburn's Collection). Type, I. 1887.

A beautiful species, readily distinguished from all others of the genus by its red tarsi. On the front of the prothorax, head, and base of rostrum the scales are mostly smaller than elsewhere, and with a faint coppery lustre; on the prothorax of one specimen there is a distinct median line of scales, but on another the line is not so evident. On the elytra the scales are rather large, and appear in a single row on each interstice, and many of them have a washed-out look. On the under-surface, however, the green is very evident.

Micraonychus cinerascens, n. sp.

Dark piceous-brown, rostrum and parts of antennae and of legs reddish or diluted with red. Densely clothed with round, obscurely whitish scales, interspersed with numerous sooty ones; but the sooty ones rather sparse on legs and almost absent from under-surface.

Head with punctures entirely concealed. Rostrum long, thin, and lightly curved, with small punctures concealed only about extreme base. *Prothorax* moderately transverse, base not much wider than apex; punctures dense and normally concealed. *Elytra* distinctly wider than prothorax, parallel-sided to near apex; with rows of more or less quadrate, deep punctures, close together, but frequently concealed. Length, $2\frac{3}{4}$-3 mm.

Hab.—South Australia: Port Lincoln, Kangaroo Island (A. M. Lea). Type, I. 2088.

At a glance apparently belonging to *Misophrice* and with the general appearance of *argentata* and *alternata*; but with a distinct pectoral canal, which extends to the abdomen, although becoming very shallow posteriorly. There are numerous subdepressed setae (distinctly visible from the sides only) amongst the elytral scales.

BRENTHIDAE.

Eupsalis pictipennis, n. sp.

Pl. xxxii., fig. 3.

♂. Bright castaneous, some parts narrowly darker, elytra with elongate flavous spots or vittae.

Head, from slightly in advance of eyes to insertion of antennae, irregularly excavated and very uneven; mandibles bifid or trifid at tips, internally with several small tubercles. Antennae with joints more or less cylindrical, the eleventh elongate. *Prothorax* smooth, with a few minutely setiferous punctures at sides, sides rather strongly dilated to beyond the middle and then abruptly narrowed at base, a transverse line parallel with the base, the space between longitudinally rugose. *Elytra* slightly narrower than prothorax, almost parallel-sided to near apex; with regular deep striae, mostly suddenly terminating near apex, the striae mostly with deep and large punctures, but becoming smaller towards suture, sides, and apex; interstices impunctate or almost so. *Femora* stout, finely and acutely dentate; tibiae notched for reception of tarsi; true fourth joint of tarsi small, but quite distinct between lobes of third. Length (including mandibles), 17-19 mm.

♀. Differs in having two small foveae between eyes and antennae, rostrum long, thin, cylindrical, and with minute mandibles, prothorax slightly narrower, elytra and abdomen slightly wider and legs slightly shorter.

Hab.—Queensland: Claudie River, several specimens cut out of an old log (J. A. Kershaw). Types in National Museum.

The male differs from the male of *promissus* in being larger, in having the head considerably wider between eyes and insertion of antennae, and the space there largely excavated, without a process projecting obliquely backwards on each side between an antenna and eye, the joints of the antennae more cylindrical, and the elytra with rows of large punctures in regular striae. The female differs from the female of that species also in being without the lateral processes on the head, and by the elytral punctures and striae being as in its own male. The markings are also different; on some specimens they are more conspicuous than on others, but they appear to be always in the same positions on each elytron as follows:—A long one on the third interstice starting from the base, one on the fourth starting from near the apex of the one on the third, one on the eighth from the base to near the middle, a small one on the fifth at the base, one on the sixth at the basal fourth, one on the third near apex, and a transverse cluster on the third to sixth (looking like an irregular interrupted fascia); the ninth interstice also is sometimes pale throughout. The pale parts of the interstices are usually wider than the adjacent parts.

Eupsalis promissus, Pasc.

Recorded by Pascoe originally from Batchian. I have previously recorded the species from the Northern Territory, but without quoting the original reference, which is:—Ann. and Mag. Nat. Hist., vol. x. (Ser. 4), 1872, p. 323, pl. xv., fig. 8. The species also occurs in Queensland (Endeavour River). The length and mandibles of the Australian specimens vary as described in the original ones.

CERAMBYCIDAE.

Uracanthus and allied Genera.

The *Uracanthides* formed Group xxiii. of Lacordaire (VIII.—388), and were by him divided into two sections; the first containing *Scolecobrotus*, *Uracanthus*, and *Aethiora*, and the second *Rhinophthalmus;* with the latter I am not now concerned. To the first group Pascoe added *Emenica*, so that at the present time it contains four genera, and these may

be tabulated (using their authors' diagnostic characters) as follows:—

Antennae composed of twelve joints [23]	*Scolecobrotus*
Antennae composed of eleven joints.	
First joint of antennae long and thin, sides of prothorax straight	*Aethiora* [24]
First joint of normal length, sides not straight.	
Elytra with apices rounded [25]	*Emenica*
Elytra with apices armed	*Uracanthus*

Uracanthus gigas, n. sp.

♂. Reddish-brown, some parts darker. Densely clothed with short ashen pubescence, denser and somewhat longer on head, prothorax (where it is slightly curly), scutellum, and sterna than elsewhere.

Head with small and large punctures intermingled on clypeus, clypeal suture partially concealed by clothing; muzzle of moderate length. Antennae with at least two joints passing elytra, fifth to tenth joints obliquely produced to one side at apex, tenth slightly shorter than ninth, and about two-thirds the length of eleventh. *Prothorax* about as long as the basal width, sides bisinuate and rounded in middle; disc uneven, becoming corrugated towards sides and in front. *Elytra* moderately wide at base, sides regularly decreasing in width posteriorly, each widely emarginate and strongly bidentate at apex; each with three feeble but distinctly elevated lines, disappearing before apex, the outer one before shoulder; with very dense subasperate punctures of two sizes intermingled, but the largest ones rather small. *Legs* long and thin, basal joint of hind tarsi almost as long as the rest combined. Length, 46-52 mm.

♀. Differs in being larger (66 mm.), elytra wider and less narrowed posteriorly, abdomen much larger, and legs shorter.

Hab.—Queensland: Kingaroy (C. French); Western Australia: Middalyd [26] (National Museum, from T. Worr).

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[23] On *Uracanthus triangularis* and *dubius* the antennae are occasionally twelve-jointed.

[24] Its only species, *fuliginea* (originally referred to *Uracanthus*), is unknown to me, as it was to Blackburn. It is frequently difficult to deal with Pascoe's genera, unless their typical species are known.

[25] Judging from the description and figure this is all I can find to distinguish the genus from *Uracanthus*, and several species of the latter genus have the apical armature so feeble that it could almost be regarded as absent, and from some it is quite absent.

[26] Possibly a temporary mining camp; the name does not appear in the latest postal guide.

Type (♂) in C. French's collection; type (♀), I. 5690, in South Australian Museum.

Much larger than any previously described species of the genus; each of the three basal joints of the male tarsi has on each side of its apex an acute spine, and these may eventually be considered as of generic importance. The head, prothorax, and scutellum are darker (almost black) than the rest of the body, but no part is of a bright colour. The femora of the male are without distinctively sexual clothing. The eleventh joint of antennae is narrowed from about the apical fourth, the narrow portion appearing to start from a feeble suture. The antennae of the female are probably shorter than those of the male, but on the only one before me they are broken off almost at the base. The two males differ somewhat, the (smaller) one from Western Australia having stouter antennae, the outer line of each mandible an almost even curve (on the type the polished apical portion is deflected almost at a right angle), the apical segment of its abdomen is more strongly concave (probably due to irregularity in drying), and the tarsal spines are less conspicuous.

URACANTHUS INSIGNIS, n. sp.

Pl. xxxii., fig. 5.

Dark piceo-castaneous, elytra (apex and suture excepted) paler. Densely clothed (except for some conspicuously glabrous spaces) with short stramineous and white pubescence.

Head with muzzle almost twice as long as wide; clypeus with a few conspicuous punctures, rounded posteriorly, with the suture deep, triangular, and wide in the middle. Antennae thin, not passing third abdominal segment, fifth to tenth joints rather feebly produced to one side at apex, tenth about two-thirds the length of eleventh. *Prothorax* much longer than wide, base almost twice as wide as apex; glabrous portion with about twenty conspicuous corrugations, but irregular and with a small node on each side of middle. *Elytra* narrow, almost parallel-sided, each widely emarginate and strongly and acutely bispinose at apex, with remnants of feebly-elevated lines; with dense and minute punctures, but on basal third with rather large partially-concealed ones. *Legs* thin, but not very long. Length, 30 mm.

Hab.—New South Wales: Narara (W. du Boulay). Type, I. 5691.

The most beautiful species of the genus, with an unusually long muzzle, curious clypeal suture, and apical spines of elytra unusually far apart. The type is probably a male, although the femora are without distinctively sexual clothing. The clothing on the head is rather dense, but the

muzzle, sides in front of eyes, base, and under-surface are glabrous, or almost so; the prothorax is widely glabrous along middle, the pubescence on each side of the glabrous space appearing as a narrow white line; between each of these and the side the pubescence is stramineous, then there is another white line, narrow at the apex and wide at the base; the scutellum and the suture for a slight distance beyond it are glabrous, then the suture for a slight distance is clothed with white pubescence, but from about the basal third is narrowly dark-brown and glabrous (although not conspicuously so), the apex of each elytron (for a space about two-thirds as long as its width) is highly polished and much darker (the spines are black); on the under-surface the clothing is white or whitish.

URACANTHUS DUBIUS, n. sp.

Pl. xxxii., fig. 6.

♂. Piceous-brown, most of elytra somewhat paler. Densely clothed with somewhat ashen short pubescence, prothorax with two feeble whitish lines, middle femora with very dense suberect pubescence filling a narrow groove along under-surface, hind femora with similar but less dense clothing.

Head with median line deep and well defined, but abruptly terminated near base, clypeus with small dense partially-concealed punctures, its suture deep and subtriangular. Antennae extending to about one-fifth from apex of elytra, fourth to tenth joints produced on one side at apex, tenth slightly shorter than ninth and about two-thirds the length of eleventh. *Prothorax* longer than wide, strongly transversely multi-corrugate, a series of small nodes across middle. *Elytra* moderately wide at base, parallel-sided from near shoulders almost to apex, each acutely bispinose at apex, with very feebly indicated elevated lines; basal third with dense small punctures, becoming even smaller posteriorly. Length (♂, ♀), 34-36 mm.

♀. Differs in being more robust, antennae distinctly shorter, and femora neither grooved nor specially clothed.

Hab.—Western Australia: Eucla (C. French); South Australia: Denial Bay (Dr. Abbott), Murat Bay (E. A. King), Fowler Bay (Blackburn's Collection, from Professor Tate). Type, I. 5482.

A large dark species, which possibly should have been treated as one of the varieties of *triangularis*, but with subhumeral markings moderately clothed instead of conspicuously glabrous; it is also considerably darker than that species, somewhat more robust, and the smallest of the six specimens the size

of the largest of numerous ones of *triangularis* before me. One of the specimens was labelled as *fuscocinereus* in the Blackburn Collection, but it is evidently not that species, which is described as being much smaller and as having three smooth brown patches at the base of each elytron: one humeral, one median, and one sutural; markings which, if constant, should readily distinguish it from all others of the genus. It will be noticed, however, that under Variety C of *triangularis* a specimen is commented upon whose left side agrees with the description of *fuscocinereus*. The elytra are without glabrous patches, but a space behind each shoulder and the tips of the elytra are darker at the positions where, in *triangularis*, the derm is glabrous, but the clothing there is almost, or quite, as dense as elsewhere. On the elytra, except at the dark patches, the pubescence, to the naked eye, appears to be in numerous fine lines, this being due to very feeble elevations; no part of the prothorax is distinctly glabrous, and the oblique whitish lines of pubescence are not very conspicuous. The tarsi, for the genus, are comparatively short.

On the type male the eleventh joint of antennae is narrowed towards the apex, but the narrower portion has its outline continuous with the basal portion, and the false suture scarcely traceable. On a female in Mr. French's Collection the apical portion is conspicuously marked off from the basal portion by a notch, and the false suture is fairly distinct; but on a second male the right antenna (the left is unfortunately broken) is quite distinctly twelve-jointed, the twelfth joint being about one-third the length of the eleventh. (27)

URACANTHUS FUSCUS, n. sp.

Pl. xxxii., fig. 7.

♂. Dark brown. Densely clothed with short stramineous pubescence; middle femora with conspicuously dense clothing along under-surface, the hind ones less densely clothed.

Head with median line narrow, base finely granulate, clypeal suture rather deep and semi-circular, muzzle rather short. Antennae just passing elytra, fourth to tenth joints produced on one side at apex and rather flat, eleventh joint about one-third longer than tenth. *Prothorax* distinctly longer than wide, sides bisinuate, disc irregularly multicorrugate, with a small node on each side of middle. *Elytra* not much wider than prothorax, moderately narrowed from

(27) On the males of *triangularis* the false suture is usually fairly conspicuous, and on two specimens in the Museum the antennae are distinctly twelve-jointed; on specimens of many other species also the false suture is sometimes very distinct.

shoulders to basal third and then parallel-sided almost to apex, suture spinose, a small notch between it and middle of apex, which is rounded; elevated lines scarcely visibly indicated; with very small punctures, but a few of moderate size behind shoulders. Length (♂, ♀), 15-24 mm.

Hab.—South Australia (old collection, Macleay Museum and Rev. A. P. Burgess), Tarcoola (C. French). Type, I. 5698.

Structurally close to *simulans*, but darker, prothorax more uniformly clothed, elytra with subhumeral markings but vaguely indicated (not at all on some specimens) and more or less clothed, and general clothing of elytra with a fine multi-lineate appearance (instead of uniform). The elytra are slightly darker near the shoulders and at the tips than elsewhere; two very feeble oblique lines of paler clothing may be traced on the prothorax of several of the specimens. The six specimens before me are all males, but their antennae vary slightly in length and thickness. The specimens from the old collection have the derm entirely of a rather pale-castaneous, with the clothing uniformly whitish, but they were long exposed to light.

URACANTHUS DISCICOLLIS, n. sp.

Pl. xxxii., figs. 8 and 9.

♂. Reddish-brown, some parts darker. Densely but irregularly clothed with whitish pubescence; all femora very densely clothed along middle of under-surface.

Head with median line narrow, deep, and abruptly terminated, base densely granulate-punctate; clypeus convex, rounded posteriorly, subtuberculate on each side in front, suture deep and rather wide. Antennae passing elytra, joints rather thin and subcylindrical, but fifth to tenth feebly produced on one side at apex, eleventh about one-third longer than tenth. *Prothorax* distinctly longer than wide, sides subangular in middle, transversely corrugated at apex, and somewhat uneven towards sides, glabrous portion smooth and with a few small punctures. *Elytra* narrow, apices rounded with suture feebly produced, with several very feebly elevated lines; with small dense punctures about base, becoming still smaller posteriorly. Length (♂, ♀), 11-24 mm.

♀. Differs in having shorter antennae, sides of prothorax less angulate in middle, elytra more parallel-sided, and legs shorter, with femora much less densely clothed along under-surface.

Hab.—Western Australia: Albany (R. Helms); South Australia (Rev. A. P. Burgess and Blackburn's Collection), Mount Lofty (S. H. Curnow), Karoonda to Peebinga (G. E.

H. Wright), Kangaroo Island (J. G. O. Tepper); Victoria: Inglewood, on *Melaleuca* sp. (D. Best); (?) New South Wales (H. J. Carter). Type, I. 5696.

In general appearance somewhat like *bivittatus* and *marginellus*, but tips of elytra evenly rounded, and with the suture very feebly produced (scarcely spinose). Of the seventeen specimens before me the tips are never emarginate, but they vary from a form in which each is distinctly rounded (fig. 9) to one in which the suture is slightly produced (fig. 8). The clothing is also different to the usual form of *bivittatus*, whose prothoracic vittae are not continuous to apex. The scutellum and suture are usually darker (sometimes almost black) than the adjacent parts. There are four wide stripes of pubescence along the prothorax: one on each side of middle and one along each side, the intervening spaces are highly polished and almost (or quite) glabrous; the median glabrous space is usually, but not always, conspicuously dilated towards the base, the dilated space being almost oval in outline; on ten specimens it is non-corrugated and with but a few small punctures, and the base is almost without corrugations, but on several specimens there are some distinct ones there, but the surface gradually changes till it is almost entirely irregularly corrugated; the disc of the Albany specimen might almost be regarded as vermiculate, with a short but distinct median line. The elytra appear to have three brown lines from base to apex: one sutural (common to both) and one near each side, but these lines are really due to their covering pubescence being much sparser than elsewhere. The false suture of the eleventh joint of antennae is rather distinct on some specimens and scarcely traceable on others. The size is very variable.

Uracanthus pertenuis, n. sp.

Pl. xxxii., figs. 10 and 11.

♂. Piceo-castaneous. Irregularly clothed with whitish pubescence.

Head with median line very narrow, base densely granulate-punctate; clypeus subtriangular, with a few small punctures, suture deep and rather wide. Antennae very thin, almost extending to the tip of elytra, fifth to tenth joints triangularly produced on one side at apex, eleventh about one-fourth longer than tenth. *Prothorax* much longer than wide, base conspicuously wider than apex, sides feebly bisinuate; conspicuously multi-corrugate, but somewhat irregular about middle. *Elytra* at base not much wider than prothorax, sides regularly decreasing in width to apex, where each is strongly emarginate and acutely bispinose; densely

and minutely punctate. *Legs* unusually thin; basal joint of hind tarsi almost as long as the rest combined. Length (♂, ♀), 14-21 mm.

♀. Differs in having somewhat shorter antennae, with the fifth to tenth joints less produced on one side at apex, and shorter legs with thinner tarsi.

Hab. — Australia (Blackburn's Collection); Western Australia (— Unbehaun); South Australia: Goolwa (old collection); Victoria: Melbourne, on *Loranthus* sp. and *Acacia armata* (D. Best); Tasmania: Hobart (A. M. Lea). Type, I. 5488.

A very thin species, at first glance somewhat suggestive of *Stephanops*, but with the muzzle of normal length. The clothing of the prothorax is somewhat as on *discicollis*, but the tips of the elytra are utterly different, and, in fact, the species is not very close to any other in the Museum. On the head the pubescence is dense between the eyes; on the prothorax it is condensed into four conspicuous vittae, with the intervening spaces polished and almost glabrous; on the elytra the pubescence is dense at the base on the sutural half for a short distance, but is narrowly continued along the suture, on each side the dense pubescence is rather narrow, but is somewhat dilated at about the basal third; the rest of the elytra is very sparsely clothed; as a result, to the naked eye, the elytra appear to be conspicuously brown, with three narrow whitish lines; on the under-surface the white pubescence is much denser at the sides of the sterna than elsewhere. The prothorax is about twice as long as its apical width. The elytra (except for the suture and margins) are without elevated lines; their tips are unusually acutely armed, but the sutural spine varies somewhat; the outer one, however, appears to be always long and acute. The males are without sexual adornment of the femora, but in addition to the differences noted above their antennae are clothed with a fringe of pubescence projecting downwards (the fringe is very fine, but is quite distinct in a good light); on the female this is represented by a few sparse setae only.

Uracanthus parvus, n. sp.

Pl. xxxii., fig. 12.

♂. Piceous. Rather sparsely clothed with whitish pubescence.

Head with a very narrow median line, base densely granulate-punctate; clypeus semi-circularly rounded, with the suture deep. Antennae thin and distinctly passing elytra, fourth to tenth joints triangularly produced on one side at

apex, eleventh about one-third longer than tenth. *Prothorax* distinctly longer than wide, base not much wider than apex, sides feebly dilated slightly nearer base than apex, with dense corrugations, somewhat irregular, across middle. *Elytra* slightly wider than prothorax, sides feebly decreasing in width to middle, thence parallel-sided to apex, where each is semi-circularly notched and rather acutely bispinose. *Legs* very thin, tibiae somewhat curved. Length, 11 mm.

Hab.—Western Australia (W. du Boulay). Type (unique), I. 5703.

The type is the smallest specimen of the genus I have seen. From the preceding species it is distinguished (apart from size) by the very different clothing (the antennae, however, are very similarly fringed), prothorax wider in front, with the sides more rounded, more conspicuously multi-corrugate, and by the outer spine of each elytron smaller than the inner one. The clothing is moderately dense between the eyes, about the middle on each side of elytra, and on each side from apex of prosternum to apex of metasternum; on the base of elytra, about the middle, it is not quite so dense as on part of the sides, but rather denser than on the adjacent parts; the disc of the pronotum is non-vittate. The femora are without sexual adornment. The false suture of the eleventh joint of antennae is very distinct.

Uracanthus tropicus, n. sp.

Pl. xxxii., fig. 13.

Piceo-castaneous, some parts paler. Rather densely clothed with stramineous pubescence, becoming whitish on antennae, under-surface, and legs.

Head with median line deep; clypeus equilaterally triangular, punctures rather small, suture deep. Antennae extending to about fourth segment of abdomen, fourth to tenth joints feebly produced on one side at apex, eleventh very little longer than tenth. *Prothorax* about twice as long as the apical width, which is but little less than that of the base, sides moderately rounded in middle; middle of disc smooth and with a few small punctures, base, apex, and sides irregularly corrugated. *Elytra* not much wider than prothorax at base, very feebly diminishing in width to apex, where each is strongly emarginate and acutely bispinose; with small punctures and some large (but not very large) ones towards base; with remnants of vaguely elevated lines. Length, 15-16 mm.

Hab.—Northern Queensland (Blackburn's Collection). Type, I. 5697.

A small narrow species, which differs from *parallelus* in being narrower, but elytra at base proportionately wider than base of prothorax, and apical spikes more acute, prothorax more conspicuously corrugated and with sparser clothing. The clothing on the disc of the prothorax is scarcely evenly distributed, but is not vittate; on each elytron there is a narrow glabrous space from the shoulder to about the basal third or half, the pubescence outside of this space being paler than that towards the suture. The middle femora of one specimen are rather more densely clothed along the middle than on the other, its front tibiae are slightly wider, and the antennae are slightly longer, these differences probably being sexual.

URACANTHUS PARALLELUS, n. sp.

Pl. xxxii., fig. 14.

♂. Rather dark-castaneous, elytra somewhat paler. Densely clothed with stramineous pubescence; middle femora very densely clothed along middle of under-surface.

Head with median line narrow and terminated some distance from base, where each is granulate-punctate; clypeus subtriangular, with irregular punctures, suture deep and rather wide. Antennae thin, not extending to apex of elytra, fifth to tenth joints feebly produced on one side at apex, eleventh very little longer than tenth. *Prothorax* much longer than wide, base not much wider than apex, sides gently rounded in middle; near base transversely corrugated. *Elytra* very little wider than prothorax, almost parallel-sided to apex, where each is semi-circularly emarginate and acutely bispinose, each with remnants of three feeble elevations; with dense and minute punctures and some of larger size (but not very large) about basal third. Length, 18 mm.

Hab.—Queensland: Cooktown. Type (unique), in National Museum (from C. French).

In general appearance very close to *froggatti*, but prothorax more densely clothed, without visible transverse corrugations except about base, elytra even more parallel-sided, the tips conspicuously emarginate, bispinose, and with clothing slightly sparser than elsewhere, the derm just before the tips not depressed, but evenly convex with the adjacent parts. To the naked eye the type appears to be parallel-sided throughout. The clothing on the upper-surface is almost evenly distributed, the only distinctly glabrous parts being a small spot in the middle of the pronotum and a small spot on each shoulder (the latter possibly due to abrasion). From some directions the tenth joint of antennae appears to be slightly longer than the eleventh.

URACANTHUS LATEROALBUS, n. sp.

Pl. xxxii., fig. 15.

♂. Of a rather dark castaneous. Densely clothed with stramineous and white pubescence.

Head with median line narrow, deep, and terminated near base, the latter densely granulate-punctate; muzzle shorter than usual; clypeus densely punctate, suture deep, semi-circular and rather wide. Antennae moderately long, fourth to tenth joints produced on one side at apex. *Prothorax* about one-fourth longer than wide, sides moderately rounded in middle; densely and strongly corrugated, but irregular about middle. *Elytra* moderately robust, their median half almost parallel-sided, each notched at apex, with the suture strongly dentate and the outer edge margining the notch subtriangular; each with several very feeble elevations or remnants of same; with very dense small punctures. *Legs* comparatively stout. Length, 29 mm.

Hab.—Western Australia: Swan River. Type (unique), I. 5695.

A comparatively robust species, with stouter antennae than usual, the antennae, however, are damaged, but ten joints remaining on one side and four on the other; possibly examination of a specimen with complete antennae would indicate that it should be referred to *Scolecobrotus*. The pubescence on the head is somewhat ochreous and denser between the eyes than elsewhere; on the prothorax it is nowhere vittate in character, but is darker on the disc than at the base, apex, and sides; on the scutellum, and on the elytra for a narrow space along the suture, the pubescence is whitish, and on each side there is a conspicuous marginal snowy stripe throughout; from the shoulder to about the basal third the stramineous pubescence is sparser than elsewhere, so that, to the naked eye, there appears a short subglabrous stripe; the pubescence on the under-surface and legs is mostly white.

The four hind femora are densely clothed with somewhat ochreous pubescence along the under-surface, and along the middle of each there is a brownish glue-like substance; it is not accidental, as it is alike on the four femora, and I have seen a similar substance, or traces of it, on the males of several other species; it is probably a secretion used for sexual attraction.

URACANTHUS ALBATUS, n. sp.

Pl. xxxii., fig. 16.

♂. Reddish-castaneous. Densely clothed with white pubescence; four hind femora with very dense subochreous

pubescence along middle of under-surface; three basal segments of abdomen each with a conspicuous medio-apical spot of moderately long subochreous hairs.

Head with a narrow median line somewhat dilated and abruptly terminated near base; clypeus with some large punctures and very minute ones, suture semi-circular and partially concealed by pubescence. Antennae extending to or slightly passing apex of elytra, fourth and fifth joints slightly, sixth to tenth acutely produced on one side at apex, eleventh joint about one-fourth longer than tenth. *Prothorax* about twice as long as the apical width, which is considerably less than that of the base, sides subangularly produced in middle, strongly transversely corrugated, but irregular about middle. *Elytra* about one-fourth wider than prothorax, feebly diminishing in width to apex, where each is strongly emarginate and acutely bispinose; basal third with dense and coarse punctures, becoming much smaller posteriorly; each with three feeble elevations, of which the outer one is rather short and scarcely traceable. Length (♂, ♀), 14-25 mm.

♀. Differs in having shorter antennae and legs, femora not densely clothed along under-surface (although more densely than is usual with females of the genus), and abdomen without tufts on the three basal segments.

Hab.—Western Australia: Kellerberrin (C. French); South Australia: Parachilna (Field Naturalists' Expedition); Victoria: Mallee and Grampians (National Museum, from C. French), Dimboola, and Bacchus Marsh, on *Acacia* sp. (D. Best). Type, I. 5492.

Fairly close to *strigosus* (whose male has very similar abdominal clothing), but elytral pubescence more uniform, prothorax distinctly shorter, and apical spines of elytra much more acute. The pubescence on the head and sides of sterna is denser than elsewhere; on the elytra, to the naked eye, it has a feebly lineate appearance, owing to the feebly elevated lines; on the prothorax it varies in density and disposition, on some specimens being almost uniformly distributed, with but a very small medio-basal glabrous spot, on others the spot is extended to appear as a narrow glabrous stripe; but on about half of the specimens before me the prothorax has four conspicuous vittae of pubescence, with the intervening spaces shining and almost glabrous. On the specimen from Kellerberrin most of the elytral pubescence is stramineous; two small Victorian specimens have the elytral clothing decidedly sparse. The false suture of the eleventh joint is so distinct on some specimens that their antennae appear to be almost twelve-jointed.

URACANTHUS LORANTHI, n. sp.

Pl. xxxii., fig. 17.

♂. Reddish-castaneous. Irregularly clothed.

Head with median line narrow and abruptly terminated before base; clypeus with very dense punctures, its suture semi-circular. Antennae distinctly passing elytra, fifth to tenth joints rather lightly produced on one side at apex, five apical joints compressed, eleventh very little longer than tenth. *Prothorax* about twice as long as the apical width, which is very little less than that of the base, sides subangularly produced in middle; surface irregularly vermiculate (in places transversely corrugate). *Elytra* not much wider than prothorax, decreasing in width to basal third, thence parallel-sided almost to apex, where each is rather lightly emarginate; basal third with dense and rather coarse punctures, becoming much smaller to middle, thence to apex shagreened; each with three feeble elevations. Length (♂, ♀), 14-18 mm.

♀. Differs in having decidedly shorter antennae, slightly shorter legs, and somewhat wider prothorax.

Hab.—Victoria: Melbourne, on *Loranthus* sp. (National Museum and D. Best). Type in National Museum; co-type, I. 5693, in South Australian Museum.

At first glance somewhat like *acutus*, but elytra with very different tips; each of these is distinctly emarginate, but the sides of the emargination vary from lightly spinose to completely unarmed. The head is moderately clothed with stramineous pubescence, the prothorax (including the sides) has four distinct vittae of similar pubescence, and along the middle a rather wide, loosely-compacted one (on some specimens, including the type male, appearing as two narrow vittae, or six in all); on the elytra (except about the base, where it is rather more distinct) the clothing is very short and inconspicuous; on the under-surface and legs the clothing is moderately dense. The clothing of the under-surface of the four hind femora is somewhat denser on the male than on the female, but is not conspicuously erect or suberect as on many males of the genus; the sexes, however, may be readily distinguished by the antennae, these passing the elytra in the male and not extending to their tips in the female.

URACANTHUS SUTURALIS, n. sp.

Pl. xxxii., fig. 18.

♂. Black, in places obscurely diluted with red. With white pubescence; under-surface of four hind femora densely clothed with moderately long ochreous pubescence.

Head with median line very narrow; clypeus with very dense punctures of irregular sizes, suture semi-circular, both suture and punctures partially concealed by clothing. Antennae distinctly passing apex of elytra, fourth to tenth produced on one side of apex, eleventh about one-third longer than tenth. *Prothorax* about twice as long as the apical width, which is much less than that of the base, sides angularly produced in middle, surface irregular across middle, and more or less corrugated elsewhere. *Elytra* distinctly wider than prothorax, parallel-sided from basal third to near apex, where each is evenly rounded, with the suture strongly spinose; with subgeminate rows of moderate-sized punctures, irregular towards base and very small and not geminate posteriorly; each with three feebly-elevated lines and traces of others. *Legs* rather long and thin. Length, 22 mm.

Hab.—South Australia: Murat Bay (E. A. King). Type (unique), I. 5692.

An almost black species, but with conspicuously white clothing; on the elytra the pubescence appears to be in regular fine lines, with the margins more densely and evenly clothed (but the basal half of the elytra of the type is much abraded); on the prothorax there is a conspicuous glabrous stripe on each side, and some glabrous spots on the disc. The elytra have the tips evenly rounded, but the strongly-spinose suture readily distinguishes from *strigosus*. The eleventh joint of antennae, about one-third from apex, appears to have a fine suture, slightly notched at its upper edge, indicating an approach to the twelfth joint of *Scolecobrotus* more distinctly than on most species of the genus.

URACANTHUS LONGICORNIS, n. sp.

Pl. xxxii., figs. 19 to 21.

♂. Bright reddish-castaneous, prothorax and scutellum somewhat darker. Densely clothed with white pubescence; hind femora shallowly grooved along under-surface, with conspicuous clothing (partly ochreous) filling the groove of each.

Head with median line deep and abruptly terminated near base, which is densely granulate-punctate; clypeus with some large punctures at sides, small and dense elsewhere, suture deep, wide, and semi-circular. Antennae with at least two joints passing elytra, fourth to tenth joints triangularly produced on one side at apex, eleventh about one-fourth longer than tenth. *Prothorax* not much longer than greatest width, sides gently incurved between base and middle, and then strongly narrowed to apex, which is not much more than half the width of base; strongly transversely corrugated,

but somewhat irregular across middle. *Elytra* not much wider than prothorax, moderately narrowed to basal third, and then parallel-sided to near apex, suture strongly spinose; about basal third with dense and rather coarse punctures, becoming much smaller from about the middle; each with two or three feebly-elevated lines. Length (♂, ♀), 12-22 mm.

♀. Differs in having shorter antennae and legs, longer and more parallel-sided elytra, wider abdomen, and hind femora with much shorter clothing along under-surface.

Hab.—Northern Queensland (Blackburn's Collection and National Museum, from C. French), Endeavour River (C. French), Cairns (E. Allen). Type, I. 5704.

One of the specimens in the National Museum was labelled by Mr. Blackburn as near *acutus;* from that species, however, it differs in having the prothorax shorter, wider at the base, and much less parallel-sided, with the tips of elytra very different; each elytron has the suture strongly acute, with the space near it either very feebly notched (fig. 19) or evenly rounded (fig. 21), but on the only female before me the sutural spine is rather small and the notch distinct (fig. 20); her antennae (unfortunately broken) are evidently considerably shorter than those of the male, with the serrations less pronounced. In some respects it appears to approach *Aposites*. The clothing on the prothorax, scutellum, extreme base, and basal sides of elytra has a rather loose woolly appearance, on the rest of the elytra it is very short and depressed; on some specimens, to the naked eye, a narrow marginal white stripe may be traced from the base to the apex.

One of the specimens in the National Museum is labelled as from South Australia, but probably in error.

Uracanthus triangularis, Hope.

Typical form. Each elytron with a conspicuous glabrous subtriangular patch behind the shoulder, the patch margined with denser clothing (appearing like a conspicuous irregular white line) than the adjacent parts; apex also conspicuously glabrous and acutely bispinose.

Var. A. Apex of elytra not glabrous, but slightly darker than the adjacent parts, subtriangular basal patch with clothing bounding it no denser or paler than elsewhere; tips acutely bispinose. Length, 27-31 mm. This variety is distinguishable from some forms of *simulans* only by the acutely bispinose apex of each elytron. It occurs in New South Wales and Victoria (Mr. D. Best reared one specimen of it from a species of *Lomatia*).

Var. B. Apex of elytra not glabrous, and not, or scarcely, darker than the adjacent parts; subhumeral patch on each elytron rather shorter than on typical form, partially clothed towards the base and conspicuously bordered (internally and posteriorly) with paler clothing. Length, 18-29 mm. This form occurs from Victoria to Western Australia, and is fairly common in the drier parts of South Australia. The size of the subhumeral patch varies, and when long the variety is only distinguished from the typical form by the non-glabrous apices. The length and acuteness of the outer spine varies, so that on some specimens it is but little more acute than on *simulans*, from which, in fact, it is not always easy to distinguish specimens of the variety.

Var. C. Subhumeral patches with margining clothing not conspicuously paler than elsewhere, apex of each elytron acutely bispinose and not glabrous. Length, 21-24 mm. This form has a similar range to Var. B, and is distinguished from it only by the clothing at sides of subhumeral patches.

A specimen, from Onslow, in Mr. French's collection, might be referred to this variety; it has the subhumeral patch on the left elytron (on the right it is different, apparently owing to abrasion) partially clothed, so that it appears to be in three irregular parts, one humeral, one sutural, and the other median. But practically, judging from the description, the only distinguishing feature of *fuscocinereus* was a basal patch similarly divided.

Uracanthus fuscocinereus, White.

The original description of this species is insufficient for its positive identification, and it was possibly founded upon one of the numerous varieties of *triangularis*. Its *habitat* was given as "Australia," not New South Wales, as in Masters' Catalogue.

Uracanthus simulans, Pasc.

Pl. xxxii. fig. 22.

A specimen from the Blackburn Collection, labelled as *simulans*, is 15 lines in length, another from Ouldea is 14, the smallest in the Museum (from Beverley) is but 8; but the average is much the same as that of the types (10-11 lines).

There are several closely-allied species from which it may be distinguished by each elytron acutely spinose at the sutural apex and not elsewhere, and clothing immediately behind glabrous elytral patches not denser than elsewhere. On the

disc of the prothorax the transverse corrugations are sometimes scarcely or not at all traceable across the middle; but on other specimens they are quite as strong there as elsewhere.

Hab.—South Australia: Parachilna, Renmark, Ouldea; Western Australia: Beverley, Mullewa, Geraldton.

Uracanthus strigosus, Pasc.

Pl. xxxii., figs. 23 to 25.

According to Pascoe, readily distinguished by its fulvous-grey hairy stripes, with naked intervals. A specimen from Victoria (the type was from New South Wales), labelled by Blackburn as *strigosus*, has four hairy lines on each elytron, with the intervals subglabrous; on the prothorax also the clothing has a sublineate appearance. A specimen from Birchip has the lineate appearance much less defined, the elytral clothing being almost uniform, except that on the extreme margins it is denser; but on the prothorax three almost glabrous lines are very conspicuous. A specimen, taken from a wattle tree at Ropes Creek, differs in being narrower and smaller (8 lines), with the prothorax somewhat narrower, with the lateral nodes more prominent, and with the three glabrous lines very conspicuously occupying most of the surface, and elytra with but two conspicuous hairy lines, although the others are traceable; its four hind femora are very densely clothed on the under-surface, this being a masculine feature; each of the three basal segments of its abdomen has a small medio-apical spot of conspicuously different clothing to the adjacent parts (this also being a male character). The apical spines (fig. 24) are more acute than usual. Another specimen, from Tarcoola, belonging to Mr. French, agrees with the Ropes Creek one, except that it is slightly larger and with the apical spines of elytra (fig. 25) smaller and closer together.

Uracanthus marginellus, Hope.

Pl. xxxii., figs. 26 and 27.

A specimen from the Blackburn Collection, and bearing his name label as *marginellus*, may possibly be that species; but the elytra are obliquely emarginate at apex, with the ends of the emarginations rounded off and not at all spinose (fig. 26); it was without locality label. Some other specimens from South Australia agree with it, others have the emargination even less pronounced, and on one there is a short inner spine (fig. 27). It is not always easy to distinguish this form from *bivittatus*, whose outer elytral spines (figs. 29 and 30) are often very blunt.

URACANTHUS PALLENS, Hope.

Pl. xxxii., fig. 28.

The original description of this species (excluding size, which in the genus is very variable) would fit several species, but as it was from Tasmania it is probable that a specimen from the Blackburn Collection (bearing a label that is similar to that of many Tasmanian specimens in his collection) may belong to it. This specimen is close to *simulans*, but the spines at the tips of its elytra (fig. 28) are somewhat different to those (fig. 22) of that species.

URACANTHUS BIVITTATUS, Newm.

Pl. xxxii., figs. 29 and 30.

A fairly common species in New South Wales and South Australia. On some specimens the lines of clothing on the pronotum are continuous to the apex and closer together than on the typical form; but this may be sexual.

URACANTHUS FROGGATTI, Blackb.

This species was described as having the apex "of elytra truncate and devoid of spines," but not correctly so, as two co-types in the Museum have the tips of elytra densely clothed with snowy pubescence, concealing their real sculpture; the tips themselves are emarginate, with the sides of the emargination lightly spinose, or at least acute; the elytra just before the tips are each conspicuously semi-circularly depressed.

Appended is a table of the species known to me:—

A. Elytra conspicuously glabrous at apex and not behind shoulders ... ... *insignis*
AA. Elytra conspicuously glabrous at apex and behind shoulders ... ... *triangularis*
AAA. Elytra with post-humeral (not longitudinal) markings only. [(typical)
a. Each elytron unispinose.
b. Post-humeral markings glabrous (at least in part) ... ... *simulans*
bb. Post-humeral markings not glabrous ... ... *fuscus* (in part)
aa. Each elytron bispinose.
c. With glabrous lines from post-humeral markings *glabrilineatus*
cc. Without such lines
d. Post-humeral markings not glabrous ... ... *dubius*
dd. Post-humeral markings glabrous.
e. Spines comparatively close together ... *pallens* (?)
ee. Spines distant ... ... *triangularis*
AAAA. Elytra with longitudinal markings or uniformly clothed. [(varieties)
B. Prothorax not distinctly longer than basal width *gigas*
BB. Prothorax distinctly longer than wide.
C. Elytral clothing condensed into numerous small fascicles ... ... *cryptophagus*

CC. Elytral clothing not so condensed.
D. Each elytron produced only in middle of apex *acutus*
DD. Tips of elytra not as in D.
E. Elytra unarmed.
f. Pronotum binodose in middle ... ... *inermis*
ff. Pronotum not binodose in middle ... *discicollis* (in [part)
EE. Elytra armed, or at least distinctly emarginate.
F. Prothorax without transverse corrugations ... ... *maleficus*
FF. Prothorax with transverse corrugations.
G. A conspicuous transverse depression near tip of each elytron ... ... *froggatti*
GG. Without such depressions.
H. Tips of elytra not notched, but suture acutely produced.
g. Three basal segments of abdomen of male each with a fascicle ... *ventralis*
gg. Abdomen non-fasciculate.
h. Derm black ... ... *suturalis*
hh. Derm not black. [part)
i. Prothorax vittate ... ... *discicollis* (in
ii. Prothorax non-vittate ... *longicornis* (in
HH. Tip of each elytron notched, and usually bispinose. [part)
I. With large punctures towards base of elytra.
j. Three basal segments of abdomen of male each with a fascicle.
k. Elytral clothing conspicuously vittate ... ... *strigosus*
kk. Elytral clothing uniform ... *albatus*
jj. Abdomen non-fasciculate.
l. Base of prothorax very little wider than apex ... ... *loranthi*
ll. Base much wider than apex ... *longicornis* (in
II. With no large punctures on elytra. [part)
J. Prothoracic clothing more or less vittate.
m. Outside of apical notch very acutely armed ... ... *pertenuis*
mm. Outside less acutely armed than suture ... ... *bivittatus*
mmm. Outside rounded ... ... *marginellus*
JJ. Prothoracic clothing non-vittate.
K. Prothoracic corrugations not continued across middle on whole of basal half.
n. Margins of elytra with paler clothing than disc ... *tropicus*
nn. Margins with clothing as on disc ... ... *parallelus*
KK. Prothoracic corrugations continued across middle of basal half.

L. Margins of elytra with conspicuous white clothing throughout ... ... *lateroalbus*
LL. Margins not as in L.
M. Derm black ... ... *ater*
MM. Derm not black.
N. Each elytron acutely bispinose at apex ... *parvus*
NN. Suture only acutely spinose.
O. Elytral clothing with a sublineate appearance ... ... *fuscus* (in part)
OO. Elytral clothing not at all lineate ... *corrugicollis*

Scolecobrotus.

This genus was originally distinguished from *Uracanthus* by its twelve-jointed antennae, many of the joints being multi-dentate in the male; by the addition of *simplex*, however, the late Rev. T. Blackburn reduced the distinction simply to an arithmetical one.

Scolecobrotus westwoodi, Hope.

A female from the Crawford Collection has a conspicuous obtuse tubercle on each elytron near the base, but not being symmetrical they are probably accidental. The species occurs in Victoria, Tasmania, South and Western Australia.

Scolecobrotus variegatus, Blackb.

Typical specimens of this form are readily distinguished from typical ones of the preceding species, by the more rugosely sculptured base of elytra, the rugose portion suddenly becoming clouded with black or dark-brown, and glabrous; from the black subbasal patches a slight infuscation is usually continued along the sides, almost or quite to the apex. But evidently the late Rev. T. Blackburn considered that these were insufficient distinguishing features, as there are specimens from Eyre Sand Patch and Birchip (obtained long after the description of *variegatus* was published) of specimens of that form labelled by him as *westwoodi*, although he does not appear to have published anything to that effect. At any rate, even if only to be considered as a variety, it is one well deserving a name. It occurs in New South Wales, Victoria, and South Australia.

A male labelled as from the Katherine River (Northern Territory) in Mr. French's collection has the elytral punctures about the base quite as coarse as on *variegatus*, but the elytra are nowhere stained with brown.

SCOLECOBROTUS UNIFORMIS, n. sp.

♂. Dark piceous-brown, almost black. Densely clothed with short, depressed, ashen pubescence.

Head with median line narrow and deep, base finely granulate. Antennae not extending to apex of elytra, fifth to twelfth joints and part of fourth multi-granulate and somewhat serrate on lower-surface, twelfth about three-fourths the length of eleventh. *Prothorax* slightly longer than wide, sides bisinuate and nodose in middle, base considerably wider than apex, densely but irregularly transversely corrugated, and subnodose on each side of middle. *Elytra* about one-fourth wider than prothorax, sides feebly decreasing in width to apex, where each is widely emarginate and acutely bispinose; with very minute punctures and remnants of feeble elevations. Length (♂, ♀), 36-44 mm.

♀. Differs in being rather more robust and with shorter antennae, on which the granules and serrations are less distinct.

Hab.—South Australia: Ouldea (R. T. Maurice). Type, I. 5688.

A large, dark, uniformly-coloured and clothed species, of which five specimens were taken by the late Mr. Maurice. Although tabulated with *validus*, it is not close to that species, being much larger, darker, and with different clothing, first and twelfth joints of antennae longer, and the twelfth conspicuously separated from the eleventh. The serrations of the antennae are due to granules and not to numerous irregular teeth, as on *westwoodi* and *variegatus*. The hind femora of the male are not clothed with special pubescence.

SCOLECOBROTUS BIMACULATUS, n. sp.

Piceous-brown, in places almost black. Densely clothed with short ashen pubescence, on each elytron condensed about middle to form a large pale spot.

Head with a narrow median line; base finely granulate. Antennae thin, two apical joints passing elytra, joints after the third obtusely granulate, with lower edges very feebly serrated, twelfth about three-fourths the length of eleventh. *Prothorax* slightly longer than wide, sides rather strongly dilated in middle, strongly but irregularly transversely corrugated throughout, but subnodose on each side of middle. *Elytra* about one-fourth wider than prothorax, sides moderately decreasing in width to about middle, and then very feebly to apex, where each is rather widely emarginate and strongly bispinose; each with two feeble elevations, disappearing about base and towards the apex; between median

spots and base with dense and rather large punctures, elsewhere with very small ones. Length, 29-33 mm.

Hab.—Western Australia (W. du Boulay), Mullewa (Miss J. F. May), Kalgoorlie (C. French). Type, I. 5689.

A rather large dark species. To the naked eye, each elytron appears to have a large pale spot (slightly longer than the prothorax), but this is entirely due to the pubescence there, being more crowded and slightly paler than elsewhere. There are some long straggling hairs at sides of prothorax. The four specimens before me appear to be all males.

The species of the genus may be tabulated as follows:—

Most joints of antennae of male multidentate.
  Elytra unicolorous ... ... *westwoodi*
  Elytra bicolorous ... ... *variegatus*
No joint of antennae multidentate.
  Apex of elytra unarmed ... ... *simplex*
  Apex of each elytron bispinose.
    Elytral clothing not uniform ... ... *bimaculatus*
    Elytral clothing uniform.
      Derm of elytra pale ... ... *validus*
      Derm of elytra dark-brown ... ... *uniformis*

Aposites.

This genus is certainly very close to *Neostenus*, as stated by Pascoe, but it is quite as close to *Uracanthus*. Lacordaire (VIII.—203) widely separated them on account of the middle cotyloid cavities being open at the sides in *Aposites* and closed in *Uracanthus*. They appear to me, however, to be open to very much the same degree in both genera. *Aposites* has the prothorax wider at the base than in most species of *Uracanthus*, and somewhat shorter elytra, more narrowed posteriorly; but it is not always easy to place some apparently connecting species.

Aposites macilentus, Pasc.

Four specimens (from South Australia and Victoria) before me appear to belong to this species; they are all males (the hind femora are densely clothed with yellowish pubescence along their under-surface), and have the suture spinose at apex and each of the four basal segments of abdomen with two glabrous spots on each side.

Aposites niger, Blackb.

This species varies considerably in size, but is readily distinguished from the preceding species and from *lanaticollis* by each of the four basal segments of abdomen having but one glabrous spot on each side. It occurs at Eucla, Mullewa, Murchison, and Tennant Creek.

Brachopsis concolor, Saund.

The reference to the figure (omitted altogether from Masters' Catalogue) in the original description was erroneously given. It should have been pl. 1, fig. 4; not pl. iv., fig. 4.

Earinus purpureus, n. sp.

Purple; head, prothorax, and under-surface purplish-blue, tip of antennae reddish. Clothed with long straggling hairs, mostly blackish on upper-surface, mostly whitish on under-surface; elytra with short, sparse, whitish pubescence.

Head with dense and rather coarse punctures; median line well defined between antennae. Antennae thin, four basal joints with distinct punctures, third joint slightly longer than first and distinctly longer than fourth, eleventh slightly longer than tenth. *Prothorax* about as long as greatest width, sides subparallel on apical half, then rapidly increasing in width towards base, but near base abruptly narrowed, with the extreme base scarcely wider than apex; with dense and coarse punctures, but on disc with five small impunctate spaces. *Elytra* no wider than widest part of prothorax, sides rather strongly narrowed to middle, thence parallel-sided to near apex; with subgeminate rows of coarse punctures, becoming irregular posteriorly, the interspaces with minute punctures. *Legs* long and thin. Length, 10-11 mm.

Hab.—South Australia: Nuriootpa, Ardrossan (J. G. O. Tepper). Type, I. 5706.

Readily distinguished from all others of the genus by its entirely dark prothorax and elytra. The four basal joints of antennae are distinctly purple, the following joints are more or less black, but with the tip of the eleventh reddish. There are about eight rows of punctures on each elytron near the base and four or five about the middle, but only two extend to the apex. As the abdomen is without special clothing on two of the segments the typical specimens (two) are probably females.

Earinus minor, n. sp.

Flavous; head between and behind eyes, clypeus, a large discal patch on prothorax, scutellum, mesosternum, most of metasternum, antennae, and most of legs black, parts of elytra and of abdomen rather deeply infuscated. Clothed with long straggling blackish and ashen hairs, elytra, in addition, with short, pale, sparse pubescence.

Head with dense and coarse punctures, becoming rather sparse on clypeus; median line well defined. Antennae long

and thin, four basal joints shining and with distinct punctures, third joint slightly longer than first and fifth, and much longer than fourth. *Prothorax* with sides triangularly dilated on median half; with irregularly distributed punctures varying from small to fairly large, but nowhere very dense. *Elytra* no wider than widest part of prothorax, sides rather lightly diminishing in width to middle; with dense and somewhat rugose punctures, becoming smaller posteriorly and sparser about base and on shoulders. *Legs* moderately long, with distinct punctures. Length, 7 mm.

Hab.—Northern Queensland (Blackburn's Collection). Type (unique), I. 5707.

The smallest described species of the genus, and allied to *pictus*, but elytra with very different markings. The large black patch on the pronotum is of irregular shape, but is triangularly notched in front and less conspicuously so behind; the infuscate parts of the elytra are the shoulders, apical sixth, and a large postmedian spot on each side vaguely extended towards the suture; on the under-surface there are three disconnected pale spots on the head, there is an infuscate streak from each of the front coxae, the basal half (or more) of each of the four basal segments of abdomen is deeply infuscated, the basal third of the femora is conspicuously flavous. As the abdomen is without special clothing on any of the segments the type is probably a female.

Earinus mimulus, Pasc.

The typical form of this species has bifasciate elytra, but the abdomen varies from entirely dark (the base of the second segment obscurely diluted with red excepted) to the second, third, and fourth segments almost entirely red. The male has a large rounded patch on each of the third and fourth abdominal segments, very densely clothed with short depressed blackish pubescence, and with numerous long hairs.

Hab.—South Australia, Victoria, New South Wales, Queensland.

Var. unifasciatus, n. var.

Differs from the typical form in having but one elytral fascia, the apical one of the typical form being entirely absent. The second, third, and fourth abdominal segments vary from entirely red to more or less narrowly margined with black at their tips: on two specimens the red is extended to the apex of the basal segment. The sexes vary as those of the typical form.

Hab.—South Australia, Victoria.

Earinus kreuslerae, Pasc.

On the males of this species the third and fourth abdominal segments are densely clothed in the middle with whitish, woolly-looking pubescence.

Hab.—South Australia, Western Australia.

Earinus pictus, Pasc.

The abdominal clothing of the males of this species is very similar to that of the preceding species.

Following is a table of the described species of the genus:—

Prothorax entirely dark	*purpureus*
Prothorax entirely pale.	
Elytra pale about scutellum	*kreuslerae*
Elytra dark about scutellum.	
Elytra bifasciate	*mimulus* (typical)
Elytra unifasciate	var. *unifasciatus*
Prothorax pale, with black markings.	
Elytra entirely dark	*bimaculatus*
Elytra partly dark.	
Humeral markings continued to suture ...	*pictus*
Humeral markings isolated.	
Antennae with three joints pale at base	*humeralis*
Antennae entirely dark	*minor*

Porithea obliqua, n. sp.

Reddish-brown, appendages somewhat paler; elytra with the apical fourth flavous, and each with a conspicuous oblique flavous fascia, commencing at or near the suture just before the middle, and ending on the side behind the middle. Clothed with very short pale pubescence; elytra with rather numerous hairs, and rather dense on antennae.

Head with small, dense, rugose punctures; clypeal suture foveate on each side; median line just traceable posteriorly, but distinct elsewhere. Antennae considerably longer than body in male, not much in female; spine on the third joint short, on the fourth and fifth very short. *Prothorax* slightly longer than wide, sides rounded and widest almost in exact middle, with an obtuse and rather short median elevation, and with four small discal tubercles; with dense, small, rugose punctures. *Elytra* distinctly wider than prothorax, feebly diminishing in width to apex, where each is obtusely rounded; with punctures of three kinds. *Femora* clavate. Length, 6½-12 mm.

Hab.—New South Wales: Dorrigo (W. Heron); Queensland: Mount Tambourine (R. Illidge and A. M. Lea). Type, I. 5490.

In general appearance fairly close to *plagiata*, but with apex of elytra pale and median markings reduced to a conspicuously oblique fascia on each, the two combined forming a wide reversed V. The markings are fairly constant, but the general colour varies from a rather bright rusty-red to dark (almost piceous) brown. The spine at the tip of the fifth antennal joint is so short as to be almost invisible. The four discal tubercles on the pronotum are placed, as it were, at the corners of an exact square. The elytral punctures are of three kinds—(1) moderately large ones, dense at the base but becoming smaller and sparser posteriorly; (2) some larger seriate ones, usually backed by small granules; (3) very dense and small ones throughout. The male differs from the female in having longer antennae and legs, with front tibiae moderately curved at the base and wider at the apex, and the prothorax slightly longer.

PORITHEA APICALIS, n. sp.

Reddish-brown, appendages bright reddish-castaneous, apical third of elytra flavous but partly infuscated. Moderately clothed with very short pale pubescence, on the under-surface somewhat sericeous in appearance; a few hairs on the elytra and sides of prothorax and numerous ones on the appendages and muzzle.

Head with very dense, small, rugose punctures; clypeal suture subfoveate on each side; median line fairly well defined, except posteriorly. Antennae thin, considerably passing elytra, finely granulate-punctate; spine at tip of third joint rather short, on the fourth and fifth much shorter. *Prothorax* considerably longer than wide, sides feebly rounded in middle, with a very feeble median elevation, and four feeble discal tubercles. *Elytra* not much but distinctly wider than widest part of prothorax, sides feebly diminishing in width to apex, where each is obtusely rounded; with three kinds of punctures. *Femora* clavate; front tibiae lightly curved at the base. Length, 9½ mm.

Hab.—Queensland: Cairns district (F. P. Dodd). Type (unique), I. 5489.

The prothorax is narrower than in *plagiata*, and the elytral markings are very different. The apical two-thirds of the flavous apical portion are somewhat infuscated, so that in certain lights the elytra appear to have a narrow subapical, very pale fascia, bounded posteriorly by a somewhat longer and slightly darker one; the apical half of the femora is somewhat darker than the rest of the legs, and the abdomen is somewhat darker than the metasternum. The four prothoracic tubercles are placed, as it were, at the corners of a

somewhat irregular square, the two front ones being rather more apart than the two hind ones. The elytral punctures are much as on the preceding species, except that the larger subseriate ones are almost confined to the suture. The type appears to be a male.

Porithea plagiata, Blackb.

The type of this species was from the Tweed River, and was described as having on the elytra "*maculis singulis lateralibus antemedianis magnis et fascia communi undulata anteapicali sat lata testaceis.*" In the Blackburn Collection there were four specimens marked as belonging to the species, but not as co-types (the type is in the British Museum); they were all from Northern Queensland. There are other specimens before me from Dorrigo, in New South Wales, to the Endeavour River in Queensland, and these demonstrate that the elytral markings are variable; in general, however, the pale markings on each elytron consist of a subtriangular or very irregular median blotch, usually not touching the suture, but occasionally doing so, and containing towards the side a dark spot, but this spot may be so continued as to divide the blotch into two unequal spots; the sinuous apical fascia may occupy from a little more to a little less space than the derm behind it; or the pale markings may be so extended as to occupy most of the surface, when the darker parts appear as a subtriangular basal space (followed or not by a few small spots), a wide postmedian fascia, and a shorter apical one. The male (I took a pair *in cop.* in the Cairns district) is usually smaller than the female, with longer antennae, prothorax somewhat longer in proportion, and front tibiae more curved and wider at apex.

The species of the genus (excluding *intorta*, unknown to me as such) may be tabulated as follows:—

Pale portion of elytra confined to apical third	*apicalis*
Pale portion not so confined.	
Apex of elytra dark	*plagiata*
Apex of elytra pale.	
Pale apical portion connected with other pale portions	*parenthica*
Pale apical portion disconnected	*obliqua*

Gastrophacodes, n. g.

Head moderately large. Eyes rather large, coarsely faceted, semi-circularly notched, upper portion much smaller than lower portion. Clypeus and labrum membranous. Mandibles short, strong, semi-circularly incised near apex. Antennae moderately long, inserted in front of ocular excisions, second joint very short, the following ones somewhat

flattened, and to the tenth feebly produced on one side at apex, all unarmed. Palpi small. *Prothorax* transverse, unarmed. *Elytra* almost parallel-sided to near apex. *Metasternum* with episterna wide and narrowed posteriorly. *Abdomen* considerably produced beyond the elytra, all the segments long. *Legs* moderately long; front coxae moderately separated, front coxal cavities open behind, obliquely produced at their sides; tibiae bispinose at apex, tarsi with claw-joints lightly dentate at base.

Excluding the abdomen, the general appearance of the remarkable insect described below is somewhat suggestive of *Phacodes*, near which genus it may be provisionally placed, despite the unarmed antennae (unarmed also in *Oebarina* and *Aesiotyche*). The elytra do not nearly cover the abdomen, and this is due, not to their abbreviation (as in *Hesthesis*), but to the great development of the abdomen. I was under the impression that the first specimen seen (from Mullewa) was a female captured before full maturity, but Mr. Brown took numerous specimens, all of which have the abdomen considerably prolonged, and on the specimen figured an oedeagus is protruding. The upper-surface of the abdomen is margined on each side (as on most *Staphylinidae*).

GASTROPHACODES VENTRICOSUS, n. sp.

Pl. xxxii. fig. 4.

Black, parts of elytra, antennae, and legs obscurely reddish-brown. With very short and sparse setae, but with straggling hairs on sides of prothorax, on muzzle, and on antennae and legs.

Head with median line deep and irregular in middle, but scarcely traceable to base; with coarse and irregular punctures; lower face transversely sculptured. Antennae with second joint (excluding its socket piece) about one-fourth the length of third, third to seventh subequal in length, eighth to tenth slightly decreasing in length, eleventh distinctly longer than tenth. *Prothorax* about one-fourth wider than long, apex with a narrowly-impressed line across under-surface and sides, but scarcely traceable across middle, sides somewhat irregularly swollen about middle; with coarse, crowded, and irregular punctures, but leaving an impunctate median line on basal half (sometimes traceable to apex). *Scutellum* shagreened, about as wide as long. *Elytra* about as wide as widest part of prothorax, almost parallel-sided to near apex, where each is widely separately rounded; basal portion with coarse and rather crowded punctures, becoming much smaller and shallower posteriorly. *Under-surface* with punctures varying from coarse and irregular to sparse and

small, head between eyes coarsely vermiculate, medio-basal portion polished and almost impunctate. Abdomen polished, first segment (along middle) as long as hind femora, the three following slightly shorter, fifth slightly longer. Length, to apex of elytra, 22-34 mm.; of abdomen, 33-64 mm.

Hab.—Western Australia: Ankertell, Yalgoo (H. W. Brown), Mullewa (Miss J. F. May). Type, I. 5769.

The elytra are without distinct costae, but to the naked eye appear to have two feeble longitudinal elevations on each; the apical half is thinner than the basal half, and on several specimens appears to be almost membranous, an appearance heightened by irregular shrinkage. The male differs from the female in having the abdomen somewhat shorter and thinner and antennae and legs somewhat longer. On some specimens there is a small polished space on each side at the base of the prothorax.

CHRYSOMELIDAE.

Eucolaspinus, new name.

Eucolaspis, Lea, n. pr.

The name *Eucolaspis* was used by Dr. Sharp in 1886 (Tr. Dubl. Soc.), so that the above substitute is proposed for the name *Eucolaspis*, recently used in the *Eumolpides* (*ante*, 1915, p. 318).

Subfamily CHRYSOMELIDES.

The Australian genera of this subfamily may, for the present purpose, be regarded as belonging to two divisions—1. *Paropsis*, and the genera or subgenera proposed (usually on trivial grounds) at its expense. 2. All other genera. Whilst the species of *Paropsis* may usually be readily identified as such, there are members of other genera that superficially might easily be mistaken for same, but these may usually be distinguished by the claws, palpi, antennae, and elytral epipleurae. Whilst hoping later on to deal with *Paropsis*, for the present my task has been confined to the second division. Some of the genera of this division are very distinct and may be easily recognized, but the claws and palpi are so important that considerable manipulation of specimens is often necessary before they can be critically examined. In a previous paper [28] I did not attach sufficient importance to these, with the result that several species of *Chrysomela* were referred to *Calomela*.[29] Some of the

[28] Australasian Association for the Advancement of Science, 1902.

[29] Some species of *Chrysomela* so strongly resemble some of *Calomela* that even as *species* they are hard to distinguish from same.

genera have been proposed on very slight grounds, so that it is sometimes difficult to be sure as to which of several genera a new species should be referred. All the new species here described, however, may be placed generically by the appended table, which, as far as possible, is based on characters previously used by Baly. As regards the dentition of the claws, with most of the species whose claws are truly armed, if these can be seen at all clearly there is usually no difficulty in noting the armature, but where the claws are very feebly armed, or are unarmed, closer examination is necessary, and in such it is usually necessary to examine several claws, as with old, greasy or dirty specimens a small amount of dirt may easily cause a claw to appear armed when it is really simple.

A. Apical joints of antennae flattened and conspicuonsly produced outwardly ... ... *Johannica*
AA. Antennae not as in A.
  B. Clypeus of male asymmetrical ... ... *Cyclonoda*
  BB. Clypeus of male symmetrical.
    C. Tip of abdomen multidentate ... ... *Ateratocerus*
    CC. Tip of abdomen not dentate.
      D. Claws simple.
        a. Elytra tuberculate.
          b. Tubercles large and few in number ... *Richmondia*
          bb. Tubercles numerous and small ... *Strumatophyma*
        aa. Elytra non-tuberculate.
          c. Intercoxal process of prosternum bilobed at base.
            d. Apical joint of maxillary palpi securiform ... ... *Chrysomela*
            dd. Apical joint not securiform.
              e. Of large size and elongate form ... *Aesernia*
              ee. Much smaller and semiglobose ... *Chalcomela*
          cc. Intercoxal process rounded or truncate at base.
            f. Form elongate.
              g. Elytra with post-humeral depressions *Lamprolina*
              gg. Elytra without such ... ... *Ethomela*
            ff. Form short and round ... ...
              h. Elytral margins inflated near shoulders ... ... *Cyclomela*
              hh. Elytral margins evenly rounded.
                i. Elytral epipleurae conspicuously concave ... ... *Pseudoparopsis*
                ii. Elytral epipleurae gently convex *Geomela*
      DD. Claws not simple.
        E. Sides of prothorax crenulate ... ... *Paralepta*
        EE. Sides not crenulate.
          F. Apical joints of maxillary palpi not securiform.
            j. Middle of metasternum produced and overhanging base of prosternum ... *Grammicomela*

jj. Middle not so produced.
k. Intercoxal process of prosternum very wide and flat ... ... *Rhaebomela*
kk. Intercoxal process not as in *k*.
l. Antennae moniliform ... ... *Phyllocharis*
ll. Antennae subfiliform.
m. Base of intercoxal process of prosternum decidedly below middle ... ... *Chalcolampra*
mm. Base level or almost level with middle ... ... *Oomela*
FF. Apical joint of maxillary palpi securiform.
G. Elytra epipleurae very wide, continuing the lines of the upper-surface ... ... *Poropteromela*
GG. Elytral epipleurae very different to those of G.
H. Intercoxal process of prosternum not bilobed at base.
n. Form elongate ... ... *Platymela*
nn. Form short ... ... *Acacicola*
HH. Intercoxal process bilobed at base.
I. Elytral punctures nowhere seriate in arrangement ... ... *Clidonotus*
II. Elytral punctures, at least in parts, seriate in arrangement
J. Antennae filiform ... ... *Eulina*
JJ. Antennae incrassate or subincrassate.
K. Intercoxal process of prosternum not conspicuously elevated in front *Calomela*
KK. Intercoxal process conspicuously elevated in front.
L. Antennae comparatively short ... ... *Augomela*
LL. Antennae comparatively long ... ... *Stethomela*, *Aesernoides*

NOTES ON TABLE.

E. From diagnosis; genus not represented in Museum.

l and *ll*. The characters used by Baly in his table; not very satisfactory, but I know of none better. The species of *Phyllocharis* are mostly conspicuously marked and frequent shrubs; those of *Chalcolampra* are mostly more or less black and have terrestrial habits; many also have aborted wings.

L and LL. Very unsatisfactory. Baly regarded *Augomela* and *Stethomela* as subgenera of *Australica (Calomela)*. The species of *Augomela* are all metallic; those of *Stethomela* and *Aesernoides* are usually less or not at all metallic, and frequently are partly red or with reddish markings; the only species hitherto referred to *Aesernoides* is a strikingly-distinct one, but its generic separation from *Stethomela* is dubious.

CHRYSOMELA JANSONI, Baly.

Calomela amethystina, Lea.

In describing *C. amethystina* I overlooked the fact that its claws are simple. It, therefore, belongs to *Chrysomela*, and appears to be a synonym of *C. jansoni*. A specimen from North-western Australia differs from the typical form in having the head entirely pale; another has a metallic blue tinge only on the basal half; both have the metasternum metallic-blue, but the rest of the under-surface is uniformly pale.

CHRYSOMELA FULVILABRIS, Germ.

This species also has simple claws, so should not have been referred to *Calomela*. Specimens were standing in Blackburn's Collection as *C. fulvilabris*, and one of these was named by Chapuis as *Caristea sapphiris* (Mast. Cat., Sp., No. 6711).

CHRYSOMELA VIRIDIPENNIS, Lea (formerly *Calomela*).

This species has also simple claws.

CHRYSOMELA INTERCOXALIS, n. sp.

Flavous, apical six joints of antennae black, the two or three preceding ones more or less infuscated.

Head with punctures varying from small to fairly large, and larger between eyes than elsewhere, with a feebly-impressed median line; clypeus with rather dense and small punctures, suture distinct. Antennae rather short and stout. *Prothorax* about thrice as wide as the median length, sides lightly bisinuate, front angles conspicuously produced, front margin rather strongly incurved to middle; near sides with coarse and rather dense punctures, much smaller and much sparser elsewhere. *Elytra* slightly wider than prothorax, but at extreme base no wider; with regular rows of not very large punctures, smaller on apical slope and larger behind shoulders than elsewhere, interstices with minute scattered punctures. Inter-coxal process of *prosternum* grooved and densely punctate along middle, base deeply notched. Length, 6-8¼ mm.

Hab.—Queensland: Cairns (Blackburn's Collection, from — Cowell, E. Allen). Type, I. 2566.

In general appearance strikingly close to *Calomela pallida*, but with the claws simple instead of conspicuously armed as on that species. A specimen from the Northern Territory (Blackburn's Collection, from J. J. Walker) apparently belongs to this species, but has antennae entirely pale.

This and the two following species, in general appearance and in structure, so closely resemble many of the pallid species of *Calomela*, differing (generically) only in the claws being simple, and many of the metallic species are also so closely allied in structure, differing also only in the claws, that to maintain the two groups as distinct genera appears almost absurd, more especially as there are forms whose claws might fairly be regarded as intermediate.

Chrysomela acaciae, n. sp.

Flavous, apical half (or more) of antennae black, tips of tibiae and parts of tarsi sometimes infuscated.

Head with dense and rather coarse punctures between eyes, much smaller and sparser elsewhere, with a feeble median line; clypeus with rather dense and small punctures, suture deep. Antennae rather short and stout. *Prothorax* more than twice as wide as long, basal two-thirds almost parallel-sided; sides with dense and coarse punctures, much sparser and smaller (but still fairly large) elsewhere. *Elytra* distinctly wider than prothorax, sides very gently rounded; with rather coarse punctures in irregular geminate or subgeminate rows, becoming smaller posteriorly, interstices with sparse and minute punctures. Inter-coxal process of *prosternum* grooved along middle, base notched. Length, 5-6½ mm.

Hab.—South Australia: Nuriootpa, Rocky Gully (J. G. O. Tepper), Murray Bridge (H. H. D. Griffith and A. M. Lea). Type, I. 2596.

Smaller than the preceding species and with coarser punctures, on the elytra the lines of punctures are without the beautiful regularity of those of that species. On all the specimens in the Museum the apical half of the elytra is distinctly paler than the basal half, but the two shades of colour are not sharply defined; living specimens, however, are of a uniform delicate pale leek-green. Specimens are fairly common on a dwarf species of *Acacia*.

Chrysomela pubiceps, n. sp.

Flavous; elytra (punctures excepted), sides of prothorax, and abdomen paler than elsewhere; apical third (or more) of antennae black or infuscated. Head with short but distinct pubescence.

Head with crowded but not very large punctures, with a feeble median carina; clypeal suture distinct. Antennae rather short and stout. *Prothorax* more than thrice as wide as long, basal two-thirds almost parallel-sided, front angles rather acutely produced; with dense and coarse punctures

throughout, the interspaces with minute ones. *Elytra* at base not wider than prothorax, sides very gently rounded; with irregularly geminate rows of fairly large punctures, becoming much smaller posteriorly, interstices with rather numerous minute ones. Inter-coxal process of *prosternum* with a few punctures, then grooved along middle, with the base deeply notched. Length, 6-7½ mm.

Hab.—South Australia: Oodnadatta (Blackburn's Collection); Queensland: Cunnamulla (H. Hardcastle). Type, I. 2604.

The claws are considerably thickened towards the base, but as they are without dentiform processes they must be regarded as simple. The head is clothed with short but distinct pubescence, of which there is not a trace on either of the preceding species; the under-surface (except abdomen) and legs are similarly clothed. The punctures on the disc of the prothorax are almost as coarse as those on the sides—an unusual feature in the genus. The elytral punctures, although irregularly geminate, are seen to be distinctly seriate in arrangement; on the Cunnamulla specimen, however, they are less conspicuously so.

Calomela curtisi, Kirby, var.

A specimen from the Capel River (Western Australia) differs from the ordinary form of this species in having the green vitta on each elytron represented by an outer ellipse only, the inner portion being exactly the same colour as the lateral and sutural regions.

Calomela aeneonitens, Clark.

A specimen from Beverley (Western Australia) possibly belongs to this species, but differs from the description in having the head bright brassy-green, and the prothorax, scutellum, and elytra uniformly greenish-blue or violet-blue (according to the point of view); the under-surface also has a distinct metallic-green gloss and the antennae are infuscate towards apex. In general appearance it is close to *Chrysomela fulvilabris*, but each of the claws has a stout basal appendix; it differs also from that species in being thinner, head with denser and coarser punctures, elytral punctures more numerous and still more irregular, and legs somewhat thinner.

Calomela pulchella, Baly, var.

A specimen from Toowoomba (Queensland) evidently belongs to this species, but its head and prothorax have a distinct coppery-green gloss, superimposed upon the red of the normal form.

Calomela waterhousei, Baly.

C. lauta, Blackb.

As the descriptions of the above read as if founded upon but one species, Mr. Arrow was asked to compare the types. In reply he wrote:—"*C. lauta*, type, agrees with a specimen named *waterhousei*, by Baly, but apparently not the actual type, which I cannot find."

Calomela ruficeps, Boi.

Australica pyrrhocephala, Clark.

Mr. Arrow was asked if he considered *pyrrhocephala* to be a synonym of *ruficeps*. Of the type he wrote:—"Agrees exactly with a specimen which appears to be a type of *ruficeps* from the Dejean Collection in this (British) Museum."

Calomela laticollis, n. sp.

Of a dingy testaceo-flavous, head somewhat darker, punctures with a purplish gloss.

Head wide, with dense punctures of fairly large or moderate sizes, on clypeus denser and smaller than elsewhere. *Prothorax* more than twice as wide as long, sides gently increasing in width to near base; punctures larger than on head but not so dense, larger towards (but not on) sides than elsewhere. *Elytra* elongate, parallel-sided to near apex; with almost regular rows of deep punctures, somewhat larger and more irregular along middle than elsewhere. Inter-coxal process of *prosternum* conspicuously bilobed at base, with a few scattered punctures. *Claws* somewhat obtusely dentate. Length, $7\frac{1}{2}$ mm.

Hab.—North-west of South Australia (H. Basedow). Type (unique), I. 2600.

At a glance close to *lauta*, but elytral punctures very different. In many respects it agrees with the description of *waterhousei*, but that species is noted as having "whole upper-surface closely covered with deep punctures," whereas on this species the majority of the elytral punctures, even to the naked eye, are in regular, or almost regular, series. The greatest width of the prothorax is slightly more than that of the elytra. The antennae (except the basal joints) are missing from the type.

Calomela tenuicornis, n. sp.

Dark bronzy-green or brassy-blue, under-surface brassy-green, labrum and appendages (apical third or more of antennae infuscated) of a dingy-flavous, knees infuscated or bluish.

Head wide with crowded punctures of median or rather small size, becoming larger and denser on clypeus. Antennae thin, extending to about middle of metasternum. *Prothorax* more than twice as wide as long, basal two-thirds parallel-sided, thence gently rounded to apex; punctures in middle much as on head, but less crowded, becoming denser and larger towards sides. *Elytra* elongate, parallel-sided to near apex: towards suture with a few irregular rows of punctures, but elsewhere larger and crowded. *Prosternum* with coarse punctures in places, the sides transversely or obliquely strigose; inter-coxal process with a row of large punctures, its base conspicuously bilobed. Length, 6-8 mm.

Hab.—Western Australia: Cue, Ankertell (H. W. Brown), Sandgate (H. J. Carter). Type, I. 2598.

There is a subdentiform swelling at the base of each of the front claws, so that these could not be regarded as simple, but on the other claws the swelling, although traceable, is not dentiform in character, hence the species might have been referred to *Chrysomela;* but as it is quite obviously allied to *lauta*, and to the preceding species, it appears better to refer it to *Calomela;* from *lauta* is differs in being more metallic, narrower, and by the conspicuous row of punctures on the inter-coxal process of prosternum (on a specimen marked as *lauta* by the late Rev. T. Blackburn, and on others of the species, the process is wider and without such a row). The antennae are thinner than in most species of the genus. Although the specimens could hardly be described as black with a metallic gloss, their upper-surface is certainly not of the bright metallic-blue or green (wholly or in part) of others of the genus, and there are no sharply-defined bands of colour on the upper-surface, but on the same specimens some of the punctures are bluish and others are purplish and greenish. The elytral punctures are deep and well defined, but (except towards the suture and on the margins) many of them are so closely placed together that they appear to be transversely or obliquely confluent, and the majority are slightly wider than long.

Some specimens from Cue are much smaller ($4\frac{1}{4}$-$4\frac{3}{4}$ mm.) and have the punctures on the inter-coxal process fewer in number and the groove containing them deeper: but they appear to represent a variety only.

Calomela prosternalis, n. sp.

Black, with a bronzy gloss, becoming bronzy-green on parts of the under-surface; labrum, antennae, palpi, and parts of legs, more or less obscurely diluted with red.

Head with crowded and distinct but rather small punctures, with a shining median line; clypeus with denser but not smaller punctures than on rest of head, its suture very distinct. Antennae not very stout, extending almost to apex of metasternum. *Prothorax* shagreened, fully twice as wide as long, sides rather strongly and evenly rounded; with crowded punctures, somewhat larger than on head, but very sparse and irregular on middle. *Elytra* shagreened, shoulders gently rounded, with subgeminate rows of rather small punctures, becoming irregular on apical slope. *Prosternum* with dense and coarse punctures, inter-coxal process conspicuously bilobed at base. Length, $8\frac{1}{4}$-$8\frac{1}{2}$ mm.

Hab.—Western Australia: Cue (H. W. Brown). Type, I. 2601.

In size and sculpture much like *imperialis*, but the upper-surface finely shagreened and without the beautiful play of colours of that species. In general appearance, at a glance, somewhat like enlarged and widened specimens of *Chrysomela australica*, but the elytral punctures are very different. The claws on the four front tarsi are conspicuously dentate, but on the hind ones are feebly so, although the teeth are fairly distinct from certain directions.

Calomela minima, n. sp.

Flavous, with smoky-brown markings.

Head with irregularly-distributed punctures, not very large towards base, but somewhat larger in front; clypeus very short, its suture irregular. Antennae extending to middle of metasternum, joints sixth to tenth transverse. *Prothorax* about twice as wide as long, basal two-thirds almost parallel-sided; with well-defined but not very large punctures, moderately crowded towards (but not on) sides, but sparser elsewhere. *Elytra* not wider than prothorax, parallel-sided to near apex; with regular rows of distinct but not very large punctures, becoming smaller posteriorly, interstices with a few minute ones. Inter-coxal process of *prosternum* with a row of punctures on each side, base obtusely bilobed. Length, $3\frac{1}{4}$-$3\frac{1}{2}$ mm.

Hab.—Queensland: Bundaberg (A. M. Lea). Type, I. 2606.

Much smaller and with colour pattern different from those of any previously-described species, but with the ordinary outlines of a *Calomela* or *Chrysomela*, and the armed claws of the former (the claws from certain directions appear to be unarmed, but from others they are seen to be distinctly, although rather obtusely, dentate near base). The darker

parts are sharply defined but somewhat variable; on the head they consist of a transverse bilobed space at the base and an irregular one in middle, two fairly large angular spots on prothorax (slightly nearer base than apex, and distinctly nearer sides than each other), most of elytra, apical half (or more) of antennae, knees, tarsi, and tips of tibiae; on one specimen the scutellum, clypeus, and a spot on each palpus are dark, and parts of its under-surface are obscurely mottled. On each elytron the paler portions are roughly and irregularly circular, so that they enclose dark spaces, of which one is basal and the other subapical.

Calomela (Platymela) sticticollis, Baly.

The ground-colour of the prothorax and under-surface of this species varies from pale-flavous to reddish-castaneous, the six prothoracic spots are usually conspicuous, but occasionally the two outer ones are absent, occasionally the legs are entirely pale. Baly described the inter-coxal process of the prosternum as truncate; it is certainly not conspicuously bilobed as on most species of *Calomela*, but as it certainly is gently incurved to its middle the expression (as a generic feature) might be somewhat misleading. He also recorded the species as from Melbourne, but probably in error; the species is fairly common from the Richmond River in New South Wales to the Coen River in Queensland.

Calomela (Platymela) rufocastanea, n. sp.

Reddish-castaneous, labrum and basal third of antennae (the apical two-thirds infuscated) flavous; tarsi, and sometimes parts of tibiae, more or less deeply infuscated.

Head with irregularly-distributed punctures, varying from moderately large to small, and larger between eyes than elsewhere; clypeus not depressed, with dense and rather small punctures, its suture distinct but not deep. Antennae rather long and thin, none of the joints transverse. *Prothorax* more than twice as wide as long, sides gently decreasing in width from base to apical fourth and then more rapidly to apex, front margin gently bisinuate; with irregularly-scattered punctures of moderate size and with numerous minute ones. *Elytra* very little wider than prothorax, with regular rows of not very large punctures, becoming much smaller posteriorly, the interstices with fairly numerous minute punctures; with a vague depression behind each shoulder. Inter-coxal process of *prosternum* with a row of punctures in a groove on each side of basal two-thirds, base gently incurved to middle. *Claws* strongly and acutely dentate (almost bifid). Length, 8-10½ mm.

Hab.—Queensland: Cairns (F. P. Dodd and E. W. Ferguson). Type, I. 2610.

The uniform colour of the upper-surface, with the entire absence of metallic gloss, will readily distinguish this species from *sticticollis* and *unilineata*, the prothoracic punctures are also more conspicuous (these are denser on each side of base than elsewhere, but towards the sides themselves they are not quite as dense as in the middle); but the general outlines and the base of the prosternum are as on those species.

Stethomela poroptera, Baly.

S. foveipennis, Jac.

Two specimens in the Blackburn Collection were labelled as *poroptera*, but as they appeared also to agree with the description of *foveipennis* Mr. Arrow was asked for his opinion as to their identity, and it was pointed out to him that, although there were slight differences in the descriptions of the colours of the antennae and legs, the elytral punctures are so very different to those of ordinary species that the differences might well be varietal. In reply he wrote:—"I think there is no question that these are one species. The antennae are practically the same in both types, and the difference in the legs is of no importance."

Stethomela submetallica, Baly.

Var. *fraternalis*, Baly.

The form described as the typical one of this species has the prothorax red, more or less stained with metallic-brown. Such a form is rather rare. One specimen in the Museum has the prothorax uniformly red and the elytra obscurely diluted with red, but several have the prothorax dark metallic-green, obscurely diluted with red; on others the head (except in front) and pronotum are entirely dark metallic-green. The under-surface, whilst usually reddish, is sometimes metallic-green in parts, occasionally it is almost black, with metallic-green in parts. The punctures usually have a purplish or greenish glitter.

Var. A. This is perhaps the commonest form of the species.

Var. B. Possibly described from an immature specimen.

Var. C, n. var. Bright coppery-green, clypeus, labrum, scutellum (occasionally with infuscate margins), antennae, palpi, and legs more or less reddish, under-surface more or less red, but in places with a metallic-green gloss, or metallic-green, some parts reddish. This is the common form about Cairns.

Var. *fraternalis*, Baly. I cannot regard *fraternalis* as more than a variety of *submetallica*. Baly noted the punctures on each elytron as being in eight double rows, but (excluding the short single subscutellar and the marginal rows) they are really nine in number.

Var. *femoralis*, n. var. Metallic purplish-blue (some specimens bluish-green with a slight coppery gloss), clypeus, labrum, scutellum, antennae, palpi, and legs (femora metallic-green in middle) more or less red; under-surface metallic-green, sides of sterna reddish, parts of abdomen more or less conspicuously diluted with red. The four specimens under examination are longer and wider (11 × 8 mm.) than the typical form and the other varieties, but structurally are so close that it does not appear desirable to describe them as representing more than a variety, but which should be named.

Hab.—Coen River (H. Hacker) and Prince of Wales Island (H. Elgner).

Stethomela parryi, Baly (?)

Two specimens from Dorrigo (the type was from "Australia") perhaps belong to this species; they have the elytral punctures widely spaced in series, resembling (except in their much smaller size and rather less irregular distribution) those of *Clidonotus gibbosus*. But Baly described the prothoracic punctures as "large"; although distinct and deep, those of the specimens in the Museum could hardly be regarded as large, but he said they were of similar size to those on the elytra, these being much smaller than on *gibbosus*. He also described the head as "impressed just above the epistome with a few deep foveae." There are a few deep punctures (similar to those on the prothorax) close to the deep clypeal suture, but as many species of the genus differ considerably in the punctures, and the curiously-distinct elytral punctures, the size and colour agree with the description, it is better to regard the specimens as possibly belonging to *parryi*.

Stethomela prasina, Baly.

Living specimens of this species are of a pale non-metallic-green, except for the tarsi, tip of palpi, and the greater portion of antennae, which are more or less deeply infuscated or blackish. But shortly after death the under-surface and legs become flavous, and frequently the head and prothorax as well. The size is usually smaller than that (5 lines) of the type, and the large shallow prothoracic foveae are often absent; the type also appeared to have uniformly pale antennae, but I have not seen such a specimen. The

species is fairly common in the northern coastal districts of New South Wales and the southern ones of Queensland. Although noted as being larger than *submetallica*, its average size is less than the average size of that species.

STETHOMELA FLAVICORNIS, Jac. (formerly AUGOMELA).

S. cupripes, Lea.

This species varies somewhat in size, and the general colour of individuals varies from metallic-blue to violet, with a slight golden gloss. Jacoby referred the species to *Augomela*, but its general outlines, with the comparatively long antennae and the front of the inter-coxal process of prosternum strongly elevated above the adjacent parts, appear to me to be conclusive that it should be referred to the closely-allied genus *Stethomela*, to which *cupripes* (a synonym of *flavicornis)* was referred.

STETHOMELA CORNUTA, Baly.

Some specimens of this species are of a brassy-green and rather smaller than the typical form; the upper edge of the mandibles of the male is also less conspicuously grooved and more sloping.

STETHOMELA OLIVACEA, Jac.

Numerous specimens from Cairns agree with the description of this species, except that they are slightly larger (8-9 mm.) and have three instead of two of the basal joints of antennae pale; on most of them portion of the base of the prothorax is feebly stained with dull-green.

STETHOMELA PURPUREIPENNIS, n. sp.

Reddish-castaneous, elytra purple.

Head with small scattered punctures, with a distinct but rather feebly-impressed median line; clypeus with rather dense but small punctures, suture well defined, an oblique impressed line from each end of suture to hind margin of eye. Antennae rather short, eighth to tenth joints transverse, eleventh slightly wider than tenth but not transverse. *Prothorax* almost thrice as wide as long, basal three-fourths almost parallel-sided; with minute punctures and some of larger size (but not very large) irregularly scattered, and denser towards sides than elsewhere. *Elytra* with outlines subcontinuous with those of prothorax; with regular rows of not very large punctures, becoming smaller posteriorly, interstices each with a row of minute punctures. Length, 5-6½ mm.

Hab.—Queensland: Coen River (H. Hacker); North-western Australia: King's Sound (W. W. Froggatt). Type, I. 2676.

A briefly-elliptic species, in general appearance fairly close to *caudata*, but entirely red except for the purple elytra (in certain lights almost any part of these may appear to have a coppery-green gloss); head with much smaller punctures, prothorax with much smaller ones, becoming very minute on disc (on the disc of *caudata* they are almost as large as on the sides), and the inter-coxal process of prosternum of very different shape (on *caudata* it is elongate-subtriangular in shape, bounded by slightly-elevated walls, which meet in front; on the present species the process is narrower, the groove is distinct throughout, and its walls diverge in front). On many specimens the scutellum has infuscated margins. The elytra are without posthumeral impressions. The apical joint of the maxillary palpi is less securiform than usual in the genus. On close examination a feeble subdentiform swelling may be seen at the base of each claw, so that it could not be regarded as simple, as at first it appears to be.

STETHOMELA RARA, n. sp.

Flavous; elytra dark metallic-blue, except the suture (very narrowly), margins (but just behind the shoulders infuscated), and epipleurae; a small infuscate spot on each side of base of prothorax, tarsi, parts of tibiae, and tips of palpi more or less infuscated, antennae obscurely bluish, three basal joints more or less flavous.

Head with rather small punctures, sparser and smaller between eyes than elsewhere, median line well defined; clypeus with moderately dense punctures, suture well defined but not very deep, a shallow oblique impression extending from near each end of same to the hind margin of the eye. Antennae moderately long and fairly stout, none of the joints transverse, second about half the length of third. *Prothorax* about thrice as wide as long, sides feebly increasing in width from base to apical third and then rapidly decreasing to apex; with small scattered punctures and a few of larger size at extreme base towards each side. *Elytra* subovate, distinctly wider than prothorax; with regular rows of moderately large punctures, becoming much smaller posteriorly, interstices with numerous minute punctures. *Claws* each with a large suboblong basal appendix. Length, 9 mm.

Hab.—New South Wales: Dorrigo (W. Heron). Type (unique), I. 4866.

In some respects close to some of the varieties of *limbata*, but head with numerous small punctures instead of a few large ones, prothorax with rather minute and scattered, but rather numerous, punctures instead of a few large ones,

elytra with numerous small ones on the interstices; apical joint of maxillary palpi less securiform, and inter-coxal process of prosternum very feebly grooved. From *olivacea* it is also readily distinguished by the punctures and by the elytral margins. The inter-coxal process rapidly slopes downwards from its middle, so that at its apex it is not conspicuously elevated above the adjacent parts, simply being the summit of two sloping sides.

STETHOMELA FLAVOMARGINATA, n. sp.

Dark reddish- (almost chocolate-) brown, parts of under-surface and of legs more or less obscurely diluted with red; palpi, basal joints of antennae (the others almost black), and parts of elytra flavous.

Head with numerous but rather small punctures; clypeus almost on the same plane and with similar punctures to rest of head, suture fairly distinct but rather feebly depressed. Antennae long and thin, none of the joints transverse. *Prothorax* more than thrice as wide as long, sides evenly rounded, front angles acute, a shallow depression near each side; with numerous small or medium-size punctures somewhat irregularly distributed, some large ones on each side in front. *Elytra* at base slightly wider than prothorax, sides gently dilated to beyond the middle and then widely rounded; with regular rows of not very large punctures, and with numerous small but distinct punctures on the interstices. *Claws* strongly and acutely dentate. Length, $7\frac{1}{2}$-$8\frac{1}{2}$ mm.

Hab.—Queensland: Cairns (F. P. Dodd, E. W. Ferguson, and A. M. Lea). Type, I. 4874.

A very aberrant species, for which perhaps a new genus should have been proposed; the apical joint of the maxillary palpi is unusually wide, and the subapical joint (which is somewhat triangular) of different shape to that of any other species that I have seen. At first glance it appears like an aberrant form of *Paropsis*,[30] but the palpi, inter-coxal process of prosternum, and elytral epipleurae are very different to those of that genus. The shape and punctures of the head and prothorax are much like those of *rufimana*. The inter-coxal process of prosternum is unusually wide and almost perfectly flat throughout; in front it appears to form the flattened culmination of two slopes, instead of being conspicuously elevated above the adjacent parts; its base is gently incurved to middle. The elytra are without post-humeral impressions; their epipleurae are flat towards the

[30] From examination of the upper-surface only, it might have been referred to Group 5 (formerly 6), Subgroup 1, of that genus.

base (where they are pale) and then become almost vertical, with a narrow gutter, where they touch the abdomen. On one specimen the labrum is conspicuously paler than the adjacent parts, on another it is slightly paler, but on two others it is uniform with them. Each elytron appears to have a large suboblong chocolate-brown patch, almost completely bordered with flavous; the flavous part commences abruptly on the margin slightly before the middle, margins the base (for a space about equal to half the length of the prothorax), is deflected near (but not on) the suture almost to apex, and then curves round near (but not on) the side almost to its starting-point.

Augomela iridea, Baly.

There are five specimens before me (from Brisbane and Mackay) that appear to belong to this species; they vary in length from 7 to 8½ mm., and with markings (although of the same kind) more sharply defined on some than on others. Baly described the head as "deep metallic blue, with a golden-green reflection." On the specimens before me the head is mostly brassy or brassy-purple, becoming green about the base; four specimens have the legs as described, but on one the femora and tibiae (knees excepted) are both conspicuously reddish. The middle of the prosternum is more densely clothed with hairs than on any other species known to me, and this character alone will readily distinguish it from them; each elytron also is without the conspicuous purple cross so typical of *ornata*, of which at first it appears to be a variety; on *ornata* also the process is flatter and wider, very sparsely clothed, and much less conspicuously notched at the base.

Augomela hypochalcea, Germ.

This species is common in parts of South Australia and of New South Wales, it occurs also at Stradbroke Island and elsewhere in Southern Queensland, and a specimen was in the Blackburn Collection, labelled as from King Sound.

Augomela multiseriata, n. sp.

Black with a slight bronzy-green gloss, labrum, antennae, palpi, tibiae, and tarsi more or less reddish.

Head with minute punctures and a vague median line; clypeal suture conspicuously trisinuate. *Prothorax* more than thrice as wide as long, sides gently rounded, front angles produced; with minute punctures, and with some larger ones sparsely distributed towards sides, but fairly numerous on extreme base. *Elytra* almost as wide as long, each side with

a subhumeral swelling; each with about twenty rows of distinct punctures, the interstices with a few minute ones, with some rather coarse punctures across basal third, but commencing some distance from suture. Inter-coxal process of *prosternum* strongly elevated above the adjacent parts, sides feebly incurved to middle, apex obtusely rounded, and base distinctly notched. *Claws* strongly dentate. Length, $7\frac{1}{2}$ mm.

Hab.—Queensland: Cairns district (F. P. Dodd). Type, I. 4871.

The apical joint of the maxillary palpi is less conspicuously securiform than on most species of the genus. The antennae are moderately long, and the species might quite as well have been referred to *Stethomela* as to *Augomela*, but its general outlines are somewhat as in *Chalcomela tricolor* and *C. viridimicans;* the rows of elytral punctures are almost twice as numerous as on other species of the allied genera. A second specimen from Bundaberg (Blackburn's Collection) has the upper-surface of a dark brassy-green, with the tibiae almost black.

AUGOMELA TIBIALIS, n. sp.

♂. Colours brightly metallic and variable; labrum, four or five basal joints of antennae (the others more or less blackish), and palpi (tip infuscated) more or less reddish.

Head with small, irregularly-distributed punctures, median line rather feeble; clypeal suture deep, a narrow impression connecting each side of it with middle of an eye. Antennae not very long, but no joint transverse. *Prothorax* scarcely thrice as wide as long, basal two-thirds almost parallel-sided; with fairly numerous, scattered, distinct punctures, larger at extreme base than elsewhere, and with numerous very minute ones. *Elytra* slightly wider than prothorax, sides feebly dilated behind shoulders, with regular rows of fairly large punctures, becoming small posteriorly, interstices with minute punctures. Inter-coxal process of *prosternum* grooved towards and strongly notched at base. Four hind *tibiae* strongly curved towards apex, with a conspicuous ridge on lower-surface. Length, $7\frac{1}{2}$-$8\frac{1}{2}$ mm.

♀. Differs in having four hind tibiae almost straight and basal joint of each tarsus somewhat narrower.

Hab.—Queensland: Coen River (W. D. Dodd and H. Hacker), Cape York (H. Elgner).

Allied to *hypochalcea*, but with more conspicuously-armed claws, the tooth of each claw is large and very distinct; on that species the tooth is but moderately distinct from certain directions and quite invisible from most; *hypochalcea* also has a foveate expansion of a puncture (or of two or three

punctures) in the fifth (counting the short scutellar one) row of punctures at the posthumeral depression, and sometimes one in the fourth as well. Both species vary considerably in colour, but whereas on *hypochalcea* each elytron (when not uniformly coloured) has a blue transverse vitta occupying the posthumeral depression, and no other; on the present species there is a wider blue vitta there, and an oblique postmedian one as well. But the four hind tibiae of the male readily distinguish the species from *hypochalcea* and from all other described ones of the genus.

The most abundant form has the upper-surface mostly of a fiery-red or golden, with parts of the clypeus and a median line on head, an irregular part of base, and the extreme lateral and apical margins of prothorax, scutellum, suture, the two vittae on each elytron (the first transverse and at the basal third, the second oblique and from just beyond the middle to near the apex) purple, but where the two colours join the surface is more or less of a golden-green: the under-surface and legs are more or less golden-green or fiery, overlaying blue or purple. But many specimens are more or less brassy-green, with purple markings as noted, and with the under-surface and legs almost entirely purple.

Var. 1. Purple, with a greenish gloss replacing the fiery-golden colour of the upper-surface, but head (labrum excepted) and under-surface entirely purple. One male of this form with the green but feebly indicated was sent by Mr. Dodd as having been taken *in cop.* with a normal female; other specimens have the green so faintly indicated that they might have been regarded as belonging to the following variety.

Var. 2. Entirely purple (except for the labrum, antennae, and palpi). This form has a deceptive resemblance to *Stethomela flavicornis*, but the prosternum is very different and antennae with only some of the basal joints partly pale, etc.

Cyclomela nitida, Baly.

On the form of this species with brassy elytra the tibiae are usually uniformly red, on the form with coppery-green elytra they are usually black at the base; one specimen before me has purplish-blue elytra, with no black on the tibiae: another with brassy elytra has knees black at the base and the prothorax (except at the sides) deeply infuscated.

Cyclomela nigricollis, n. sp.

Head, basal joints of antennae (the others black), palpi, and legs reddish-flavous: prothorax, scutellum, and under-surface black, elytra metallic-green.

Head with sparse and small punctures and a feeble median line; clypeus with small but more numerous punctures than elsewhere, suture somewhat curved, and a vague depression extending from each end to middle of an eye. Antennae moderately long and thin. *Prothorax* about thrice as wide as the median length, base widely lobed in middle, basal three-fourths almost parallel-sided, front angles produced and strongly rounded; with minute punctures and with some rather large scattered ones on sides and at extreme base. *Elytra* with sides conspicuously inflated near shoulders, with regular rows of moderately-large punctures, becoming much smaller posteriorly, a much larger puncture or fovea in the eighth row near shoulder, interstices with numerous minute punctures. Inter-coxal process of *prosternum* obtusely pointed in front, middle depressed towards base. *Claws* simple. Length, 9 mm.

Hab.—Queensland: Bundaberg (Blackburn's Collection). Type (unique), I. 2678.

Practically the only feature distinguishing *Cyclomela* from *Chalcomela* is the rounded base of the inter-coxal process, and on the type of the present species the pin has passed through the mesosternum forcing its middle on to the prosternal process, but this appears to be rounded. From *nitida* it differs in being slightly less rounded, with conspicuous punctures on sides of prothorax, and in colour. Structurally it is fairly close to *Chalcomela viridimicans*, but the head is reddish and prothorax black. In some lights the elytra have a purplish gloss.

Chalcomela eximia, Baly.

Var. *cupreosplendens*, Lea.

The typical form of this species has the prothorax more or less golden or golden-green, with the extreme apex and a rather wide basal fascia purplish-blue; the elytra are purplish-blue with golden or golden-green markings, forming on the left elytron an irregular figure 6 (and, of course, reversed on the right), all the golden markings where they join the purple ones are more or less conspicuously bordered with green. The figure that accompanies the original description is a very poor one and somewhat misleading. With a fairly-extensive series of specimens it becomes evident that there are many colour varieties, one of which was previously named as distinct. On the prothorax a common variation is for the purple or purplish-blue marking to be so extended that the golden band of the typical form is broken up into three large spots—a somewhat wedge-shaped one on each side and

a transversely-elliptic or rounded one between, all three, however, sometimes obscurely connected in some lights. On the under-surface and legs the golden markings also vary in extent. The species occurs from Northern Queensland (including some of the adjacent islands) to Roebuck Bay in North-western Australia.

Var. A. Golden markings of prothorax in the form of three disconnected spots, on elytra irregularly margining the base and sides, and turning up for a slight distance along suture, but not touching the suture itself (on all the specimens before me, both of the typical form and of the varieties, the suture is invariably purple or blue, although sometimes very narrowly so).

Var. B. Like A, but with golden zone of prothorax not broken up into spots, although with undulated margins.

Var. C. Each elytron with golden markings connected along (but not touching) suture, as well as side, and enclosing two large purple spots, the first irregularly curved, the second irregularly subtriangular.

Var. D. With markings as on typical form, but of a fiery golden-red, not margined with green.

Var. *cupreosplendens*, Lea. Golden markings of elytra confined to base and sides.

Chalcomela variegata, Jac.

A specimen from Dorrigo [31] probably belongs to this species, but it has the prothorax coppery-green and purple, instead of cupreous and green: the elytra also have obscurely purplish markings, but these are common variations in the subfamily. Two other specimens, from Gympie, probably also belong to the species, but differ in having the under-surface, legs (except for a metallic-green gloss in places), and antennae dull-red, the labrum also is of but one colour (instead of two as on the type and the Dorrigo specimen); one has the prothorax entirely metallic-green, on the other it has obscurely-defined patches of purple. On all the suture is narrowly purplish. On these specimens, on close examination and from certain directions, a feeble subdentiform swelling may be seen at the base of each claw, but it could easily be overlooked, even when searched for; so that, as the apical joint of the maxillary palpi is not securiform, it appears better left in *Chalcomela* than transferred to *Augomela*, to several species *Chrysochalcea* and allies) of which it bears a strong resemblance.

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[31] Near the Richmond River, probably the original locality, although such was given as Richmond.

CHALCOMELA TRICOLOR, Lea.

Several specimens from Cairns differ from the type in being considerably smaller (down to 5½ mm.); one has the upper-surface entirely black, except for a slight greenish gloss, another has it purplish-black, also with a greenish gloss, and another has elytra black with a vague purplish gloss, but the prothorax of a beautiful bright-purple. The prothoracic punctures (except on the sides, where there are always some large ones) are usually dense and small, but still distinct, but on some specimens they are so small as almost to reach the vanishing point.

CHALCOMELA FULVIPES, Jac.

Two specimens from Brisbane probably belong to this species, but Jacoby described the elytra as "strongly and regularly punctate-striate," and again as "very regularly punctate-striate, the punctures closely placed, nearly obsolete at the apex." The specimens in the Museum are very regularly seriate- (not striate-[32]) punctate, but the punctures are (for the group) rather small, although distinct. He described the terminal joint of the palpi as being "nearly as long as the preceding one," whereas on these specimens it is distinctly shorter and narrower. He also described the clypeus as "not separated from the face"; the specimens in the Museum have the clypeal suture marked by a thin coloured line, but not by a deep groove, as in many species of the group.

CHALCOMELA SIMULANS, n. sp.

Black, in certain lights with a vague purplish or greenish gloss; antennae, palpi, and legs (femora excepted) flavous.

Head with sparse and minute punctures, median line feeble; clypeus with rather dense punctures, suture distinct and somewhat curved, a narrow depression connecting each end of same with the middle of an eye. Antennae rather thin, none of the joints transverse. *Prothorax* about thrice as wide as median length, sides feebly diminishing in width to apical fourth, and then more strongly to apex; with numerous sharply-defined, but rather small, irregularly-distributed punctures, somewhat larger at extreme base than elsewhere. *Elytra* very little longer than wide, shoulders strongly rounded, and sides feebly dilated beyond same; with regular rows of not very large but sharply-defined punctures, becoming much smaller posteriorly; interstices almost or quite impunctate. Inter-coxal process of *prosternum* scarcely

[32] Many describers have used the word "striate" when true striae are absent from the elytra and the word "seriate" should have been used.

elevated in front, grooved along middle, base bilobed. *Claws* simple. Length, $6\frac{1}{4}$ mm.

Hab.—Queensland: Cairns district (A. M. Lea). Type, I. 2659.

Structurally close to *illudens* and *variegata*, but rather more rounded, with somewhat smaller punctures and very differently coloured. In general appearance it is close to *Stethomela atra*, but which has conspicuously armed claws; there is also a strong general resemblance to *Augomela multiseriata*, but, apart from several generic features, each elytron has but eleven rows of punctures. The elytra are entirely without transverse posthumeral depressions, and the punctures at the usual position of same are not larger than elsewhere. A second specimen (from the Blackburn Collection, without locality label) is almost entirely without metallic gloss.

LAMPROLINA GRANDIS, Baly.

The large size and absence of foveae from the posthumeral depressions render this species a very distinct one. It was named from a single damaged specimen from an unknown locality. Some specimens from the Northern Territory were identified by the late Rev. T. Blackburn as belonging to the species and agree with the description; they have the antennae dark metallic-violet, and the three basal joints and the tarsi are entirely dark; but some specimens labelled as from Central Australia have most of the antennal joints black.

LAMPROLINA SIMILLIMA, Baly.

On the typical form of this species the elytra have a distinctly coppery tone, without the least trace of blue or green; it may occasionally be taken near Sydney with (the there abundant) *aeneipennis* on *Bursaria spinosa*.

Var. (?) Some specimens from Mount Tambourine may represent a variety; they differ in having the elytra of a rather obscure metallic bluish-green, with rather more distinct series of punctures, although still small. It is quite possible, however, that they belong to *jansoni*.

LAMPROLINA DISCOIDALIS, Baly.

On each of four specimens that appear to belong to this species (including two standing in the Blackburn Collection as such) the prothoracic marking consists of an irregular blotch occupying the median half of the apex and terminated before the base, with its posterior edge quadrilobed (the two median lobes nearer the base than the others). On the head the markings consist of two rather large inter-ocular spots,

sometimes conjoined. The elytral punctures, although small, are quite distinct, and readily traceable almost to the apex.

LAMPROLINA SIMPLICIPENNIS, n. sp.

Brassy-purple or coppery-green; head, prothorax (a wide median brassy-green vitta excepted), legs (tarsi and parts of tibiae blackish), and part of abdomen more or less reddish, antennae purplish, part of basal joint obscurely reddish.

Head almost impunctate, with a wide subtriangular depression in middle and a shallow one close to each eye; clypeus depressed, suture rather deep. Antennae stout, extending almost to apex of metasternum. *Prothorax* about twice as wide as long, with two rather small irregular foveae on each side, a few punctures at base on each side, elsewhere impunctate. *Elytra* distinctly wider than prothorax, sides gently rounded; with a shallow post-humeral depression, in which are two or three large punctures, elsewhere impunctate or almost so. Length, $6\frac{1}{2}$-7 mm.

Hab.—New South Wales: Dorrigo (W. Heron); Queensland: Mount Tambourine (H. Hacker and R. Illidge). Type, I. 2630.

In general appearance strikingly close to *discoidalis*, but differs in the head being immaculate, the prothorax with a wide median vitta continuous from base to apex, the lateral foveae considerably smaller, but in particular by the elytra, these at first appearing to be without series of punctures, and only on close examination may a few seriate ones be seen inwards of the posthumeral depression; on *discoidalis*, although for the genus rather small, the rows of punctures are quite distinct.

LAMPROLINA FOVEILATERA, n. sp.

Reddish-flavous; elytra, tarsi, and apical parts of tibiae metallic greenish-blue, antennae purple, the basal joints metallic-green, palpi black with a metallic gloss.

Head with a subtriangular depression in middle and a shallow one close to each eye, with a few large and some smaller punctures scattered about; clypeal suture semicircular and rather deep. Antennae rather long and stout. *Prothorax* not twice as wide as long; with two coarsely-punctured foveae on each side, about base with some coarse punctures, becoming crowded towards each side at extreme base, with scattered and rather small but distinct ones elsewhere. *Elytra* elongate, widest at about apical third; with rows of distinct and moderately large punctures, becoming minute posteriorly, basal three-fifths on each side with some

coarse punctures, occasionally conjoined to form foveae, the first on the fifth row inwards of the (rather feeble) post-humeral depression, two on the sixth row before same, four or five on the subouter row, the intervening rows with from one to three. Length, 11-11½ mm.

Hab.—Queensland: Mount Tambourine. Type, I. 2631.

Allied to *aeneipennis*, but much larger and elytra blue; the coarse elytral sculpture is suggestive of *Johannica*. A specimen from Cairns (H. Hacker) has the elytra more purplish (its suture with a greenish gloss), and the two basal segments of abdomen and base of the third metallic bluish-green, with purple reflections. A specimen from Gosford (H. W. Cox) is still more aberrant; it is paler, with its elytra, two basal segments of abdomen, and base of the third brassy, somewhat as on *simillima*, but with a more golden tone, not the brassy-green of *aeneipennis;* it is also larger (12 mm.) than any of the others.

Phyllocharis.

In a subfamily many of whose species are conspicuously variable, this genus stands pre-eminent for variability. Some are so inconstant that it is difficult, if not impossible, to find two exactly alike, and others have forms with conspicuous and apparently typical markings, yet with long series all these apparently distinct forms have distinct connecting varieties: in this respect *cyanicornis* and *jansoni* are the most remarkable.

Phyllocharis blackburni, Jac. (formerly Platymela).

In Blackburn's Collection [33] there were two specimens of this species, one, evidently a co-type, labelled as having been received from Jacoby. They differ from the description in having but two joints of antennae whitish. Jacoby, in his description, said "thorax bifoveolate," and again, "thorax . . . the sides with a deep fovea." On the specimens in the Museum, however, the pronotum is without fovea, but each flank of the prosternum has a depression.

Phyllocharis marmorata, Lea, var.

A specimen from Blackburn's Collection (without a locality label) is evidently a variety of this species. It differs from the description in having but two apical joints of antennae and part of the preceding one pale, and the pale apical portion of elytra with an obscure, infuscate fascia.

[33] Standing under *Phyllocharis*, its correct genus.

PHYLLOCHARIS 10-MACULATA, Lea, var.

A specimen, from Cape York, evidently belonging to this species, has a large subquadrate medio-basal dark patch on the pronotum.

PHYLLOCHARIS CAERULEA, n. sp.

Deep metallic-blue, head sometimes with a greenish gloss, under-surface dark purplish-green or bluish, legs red, tibiae and tarsi dark metallic-green; seven basal joints of antennae more or less purplish, three following joints and part of the next whitish, apical parts of eleventh deeply infuscated.

Head with a wide median excavation and some small scattered punctures. Antennae with fifth, sixth, and seventh joints wider than the others. Apical joint of palpi wider than long, somewhat shorter than the preceding joint. *Prothorax* scarcely twice as wide as long; with a few scattered punctures and some conspicuous ones on each side of base, with two deep foveae towards each side. *Elytra* subelliptic, with rows of distinct but not very large punctures, becoming smaller and irregular posteriorly; behind each shoulder with two transverse rows of foveae or large punctures, the first row extending to the second longitudinal row, and the second to the sixth. Inter-coxal process of *prosternum* with a few large punctures, obtusely produced at apex, base conspicuously bilobed. Length, $8\frac{1}{4}$-$8\frac{1}{2}$ mm.

Hab.—Queensland: Cairns (F. P. Dodd). Type, I. 2635.

The entirely dark prothorax and elytra readily distinguish from all known species of the genus except *fulvifrons*, which is described as having a fulvous head and differently-coloured antennae, besides being structurally different. In general appearance, except for the antennae, it is quite close to the species of *Johannica*.

PHYLLOCHARIS DELICATA, n. sp.

Flavous; a bilobed spot at base of prothorax, six spots on elytra, antennae (basal joint reddish), legs (in parts reddish), and parts of under-surface black, with a metallic gloss.

Head impunctate; rather strongly convex in middle of base, a conspicuous oblique line near each eye joining in with the clypeal suture near its middle. Antennae moderately long, five basal joints shining, the others densely pubescent. *Prothorax* more than thrice as wide as long, sides rounded towards apex, front margin distinctly incurved to middle; with a few conspicuous punctures about middle and some larger ones on each side of base. *Elytra* with shoulders evenly

and sides gently rounded, a deep oblique impression between each shoulder and scutellum, and a shallow one behind each shoulder; with regular rows of distinct but not very large punctures, becoming smaller and irregular posteriorly, interstices impunctate or almost so. Inter-coxal process of *prosternum* not conspicuously ridged in front, basal half deeply grooved, base conspicuously bilobed. Length, $4\frac{1}{2}$ mm.

Hab.—Queensland: Cairns district (A. M. Lea). Type (unique), I. 2681.

A beautiful little species, not close to any other of the genus, although at first glance apparently close to *impressicollis*, but markings different, prothorax wider in proportion, and very differently sculptured. From some directions each side of the prothorax appears to be obtusely dentate about the middle, this really being due to the rapid downward slope of the margins. The scutellum at a glance appears to be black, but is really of a rather dark-red: there are four subangular spots across the basal third of the elytra, the outer ones about twice the size of and somewhat to the rear of the others, the two other spots are transversely elliptic, and placed at the apical third: the dark parts of the undersurface are the basal segment of abdomen, flanks of the mesosternum and metasternum, and a subtriangular space on each side of the metasternum, extending from its hind corner to the middle coxa.

Chalcolampra chalybeata, Baly.

On some specimens of this species (which appears to be confined to Tasmania) there is a large, round, sharply-limited black spot on the reddish head, but on others the two colours are more diffused, so that the head appears to be mottled. The colours of the rest of the body and of the appendages are generally like those of some specimens of *rufipes*, but the species is decidedly narrower and the punctures are not the same.

Chalcolampra quadrifasciata, n. sp.

Flavous, apical half (or more) of antennae infuscated; elytra with four scarlet fasciae.

Head almost impunctate, with a vague median line and a fairly-conspicuous fovea near each eye. Antennae rather long, third and fourth joints subequal and slightly shorter than the following ones. *Prothorax* about thrice as wide as long, apex gently incurved to middle, sides evenly rounded; with a few large punctures about sides, but none elsewhere. *Elytra* elongate, distinctly wider than prothorax at base, sides gently rounded, with numerous minute, almost evenly-distributed punctures. Inter-coxal process of *prosternum*

narrow between coxae, wider and bilobed at base. Each *claw* with a large subacute basal appendix. Length, 5-5½ mm.

Hab.—Queensland: Bundaberg (H. W. Brown), Brisbane (Dr. A. J. Turner). Type, I. 5686.

At a glance, apparently not even belonging to *Chalcolampra*, but structurally it certainly appears to belong to the same genus as *18-guttata* and *marmorata*. The apical joint of the maxillary palpi is not securiform, but is slightly larger than the subapical one. The elytral fasciae differ slightly on the four specimens under examination, they are almost equidistant and do not extend to the sides, the first is sometimes not continuous across the suture, the second is distinctly interrupted by the suture, and the third and fourth are continuous and narrowly connected along the suture; the third is the longest, the fourth the shortest, and the second the narrowest. The elytral punctures are really very small and not at all seriate in arrangement, but owing to "water-logging" they appear to be of moderate size, and in places subseriate in arrangement.

The colours of this and of the following species are now as described, but probably on living specimens the ground-colour is more or less green.

Chalcolampra tenuis, n. sp.

Flavous, most of antennae infuscated; elytra with scarlet markings.

Head with a few small punctures, median line feebly impressed, clypeal suture conspicuous, an oblique impression extending backwards from each side. Antennae almost as in preceding species. *Prothorax* not thrice as wide as long, sides almost parallel; with some fairly large, irregular punctures on sides, minute ones elsewhere. *Elytra* long and thin, distinctly wider than prothorax at base, shoulders rounded, sides parallel to beyond the middle; with rows of moderately large punctures, larger in the fifth, eighth, and ninth rows near basal third than elsewhere; interstices with minute punctures. Inter-coxal process of *prosternum* obtusely bilobed at base. *Claws* strongly appendiculate. Length, 5 mm.

Hab.—Queensland: Cairns. Type (unique), I. 2692.

Structurally close to *18-guttata*, but with totally different markings. From the preceding species it is readily distinguished by the elytral punctures, apart from the markings, which are probably subject to variation; the prothorax is also considerably narrower. The elytral markings on the type appear to consist of four abbreviated equi-distant fasciae, not extending beyond the fourth interstice, but all connected along the suture.

Poropteromela, n. g.

Antennae long and thin. Apical joint of maxillary palpi widely securiform, distinctly longer than the preceding one, which is equi-laterally triangular. *Prothorax* short, apex moderately emarginate and much narrower than base, sides oblique and (as seen from below) in the forms of wide flanges. *Elytra* very wide, sides strongly rounded, epipleurae very wide and thin, continuing the slopes of the upper-surface. Inter-coxal process of *prosternum* sloping in front, grooved along middle, base bilobed. *Claws* each with a strong and acutely-armed basal appendix.

Owing to the great width of their epipleurae (curiously suggestive of the *Cassidides*) the elytra are actually wider than long; they might almost be regarded as a great exaggeration of the concave ones of *Paropsis* (near which the genus should perhaps be placed), their upper-surface is punctured as the rest of the elytra, and even on the under-surface the pitting is quite evident. I have known the Richmond River specimen for some years, but its general appearance being so very unlike any other Australian Chrysomelid had doubts as to its being really Australian until the sight of the Dorrigo specimen removed those doubts.

Poropteromela epipleuralis, n. sp.

Of a dingy livid-flavous throughout.

Head with dense and fairly-large punctures, becoming smaller towards base. Antennae with third joint almost as long as first and second combined, fourth slightly shorter than fifth, the others slightly decreasing in length, but eleventh slightly longer than tenth. *Prothorax* about four times as wide as long, front angles slightly produced; punctures denser and slightly larger than on head. *Scutellum* subtriangular, impunctate. *Elytra* distinctly wider than prothorax at base, sides strongly and evenly rounded; strongly convex, with very dense punctures. *Legs* rather thin; first and fourth joints of about equal length. Length, 7-9 mm.

Hab.—New South Wales: Dorrigo (W. Heron), Acacia Creek (H. J. Carter), Richmond River. Type, I. 4867.

The colour is now as described, but as with so many similarly-coloured ones was probably more or less green in living specimens. Seen from the side, the body appears to be at its greatest height in the middle, this being at about the basal third of elytra: from this point the elytra appear to slope off in three planes, a somewhat rounded one towards the base, ending on each shoulder, and an almost even plane ending on each margin. The abdomen of the male is

flatter than that of the female, and the apical segment is feebly depressed in middle; the basal joint of the front tarsi is also somewhat larger and more rounded on sides.

Grammicomela, n. g.

Antennae rather long, subfiliform. Apical joint of maxillary palpi shorter than the preceding one, inner side slightly shorter than the outer, apex elliptic in outline. Inter-coxal process of *prosternum* not conspicuously elevated in front, base depressed and feebly bilobed, middle depressed. Metasternum with middle produced between middle coxae, concealing inter-coxal process of mesosternum and overhanging base of prosternum. *Claws* with a wide basal appendix.

The general outlines are somewhat suggestive of *Paropsis*, but the apical joint of the maxillary palpi is not securiform, and the elytral epipleurae are flat or feebly convex throughout. In some respects it approaches *Stethomela*, but the remarkable way the middle of the metasternum is produced, so as to take the place of the inter-coxal process of the mesosternum, should prevent it from being confused with any other Australian genus of the subfamily.

Grammicomela quadrilineata, n. sp.

Reddish flavous; elytra flavous, with four conspicuous black lines; antennae (parts of two or three basal joints excepted), tarsi, and apex of tibiae black or infuscated.

Head with small and irregularly-distributed punctures; clypeal suture conspicuous, with three impressions from its hind margin: a median one extending to the forehead, and lateral ones extending to the hind margins of the eyes. Antennae extending to hind coxae, third joint almost twice the length of second, the succeeding ones somewhat flattened and dilated, and usually with a vague bluish gloss. *Prothorax* more than thrice as wide as long, sides rather strongly rounded in front, with the front angles lightly produced; with small scattered punctures, but a few of large size at extreme base towards each side. *Scutellum* triangular, impunctate. *Elytra* not much wider than prothorax at base, almost parallel-sided for more than half of their length; with regular rows of conspicuous but not very large punctures, the interstices with small scattered ones. *Legs* moderately long and stout. Length, 8-9½ mm.

Hab.—New South Wales: Dorrigo (H. J. Carter and W. Heron). Type, I. 4868.

The four black stripes commence at or close to the base of the elytra (on some specimens the two inner ones appear to

commence on the base of the prothorax), and are usually, but not always, conjoined close to the apex, they are situated on the third and seventh interstices, but partially extend on to the adjacent ones; the upper portion of the two basal joints of tarsi are pale along the middle, so that at first glance the tarsi appear to be grooved there; on two specimens the narrow prothoracic margins and the extreme margins of the basal half of the elytra are infuscated. On three of the specimens the seriate punctures on the elytra, owing to "waterlogging," appear to be much larger than they really are, rounded and close together; but they are really neither very large nor close together.

Ethomela, n. g.

Eyes transverse, coarsely faceted. Antennae long, joints more or less filiform. Apical joint of maxillary palpi conical, slightly longer than the preceding joint. Epipleurae of *elytra* narrow, feebly concave, disappearing before apex. Inter-coxal process of *prosternum* narrow, not keeled in front, base truncate, with the sides gently rounded; coxal cavities closed. *Legs* not very long; claws unarmed.

The species described below is quite an ordinary-looking one, with an elongate-elliptic outline much as in *Chrysomela*, *Calomela*, and some species of *Chalcolampra*, and like the species of those genera it is without the posthumeral depressions so conspicuous on many of the subfamily; but its structural features forbid its being referred to any of the three named. From *Chrysomela* (near which it should be placed) it is distinguished by the non-securiform apical joint of palpi, and truncate apex of inter-coxal process of prosternum; from the others it is distinguished by the unarmed claws; there is a feeble swelling at the base of each claw, but it is not at all dentiform in character, and is seen with difficulty, so that the claws should rightly be regarded as unarmed. The front coxal cavities are each closed behind by a narrow ridge, obliquely cleft at its narrowest. In the table of genera it is associated with *Lamprolina*, with which, in general appearance, it has little in common.

Ethomela decipiens, n. sp.

Reddish-castaneous, appendages somewhat paler, antennae lightly infuscated towards apex; elytra coppery-brown.

Head with numerous rather small punctures; clypeal suture well defined. *Prothorax* about thrice as wide as long, sides evenly rounded and almost as wide at apex as at base; with numerous small scattered punctures, and some fairly

large ones towards sides. *Scutellum* semi-circularly triangular and impunctate. *Elytra* very little wider than prothorax, parallel-sided to near apex; with regular rows of not very large but conspicuous punctures, becoming smaller posteriorly; interstices with very few punctures. Length, 3½-5 mm.

Hab.—Australia (C. French); Western Australia:- Lake Austin and Cue (H. W. Brown). Type, I. 3398.

Structurally apparently close to description of *Chrysomela micans*, but elytra (on the six specimens in the Museum) not at all green, and antennae pale almost throughout. The basal joint of the front tarsi is wider than the third on the male and about the same width on the female.

JOHANNICA METALLICA, n. sp.

Metallic-blue or purple; in places bronzy or brassy.

Head with irregular punctures dense only on clypeus; with a fairly large median fovea, and near each side of same a narrow deeply-impressed line, a less deeply-impressed line almost touching each eye. Antennae stout, third joint longer than first or fourth, sixth joint slightly inflated on one side, seventh more noticeably so, the three following joints strongly inflated, eleventh joint rather short and rounded, but semi-double. *Prothorax* about twice as wide as long, with coarse irregular punctures, and towards each side with from one to three irregular depressions. *Elytra* with rows of fairly large punctures, becoming smaller posteriorly, but each elytron with about nine much larger punctures or small foveae (some semi-double) on the basal two-thirds. Length, 9½-11 mm.

Hab.—Queensland: Stannery Hills and Annan River (H. W. Brown). Type, I. 4857, in South Australian Museum; co-type, K. 18797, in Australian Museum.

The head is mostly brassy; the antennae are almost entirely deep-purple; most of the prothorax is brassy or brassy-purple, only small parts of the base being bluish, the scutellum is entirely brassy or bronzy; on the elytra the shoulders and a large subapical patch (but not the extreme apex) are brassy, with the colour rapidly changing through coppery-green to the general purple tone; the larger punctures or foveae are more or less metallic; parts of the sterna, base of abdomen, and middle of femora are more or less coppery. The depressions on the sides of the prothorax are not alike on any two of the five specimens before me, and sometimes differ on the sides of an individual; they are mostly due to clusters of large punctures. The antennae are very similar to those of *gemellata*, but the colours of the prothorax and elytra are very different; the elytral punctures

are much larger and the foveae much smaller, the prothoracic punctures are also considerably larger: in these respects it also differs from *striata*, and that species has some of the antennal joints still more conspicuously inflated.

GEOMELA, n. g.

Eyes rather coarsely faceted and prominent. Antennae of variable length, third joint rather long. Maxillary palpi rather short, apical joint subconical and longer than the preceding one. Epipleurae of *elytra* not very wide at the base and disappearing before apex, gently convex, or at most flattened in parts. Inter-coxal process of *prosternum* wedge-shaped in front, base truncate or gently rounded; front coxal cavities widely open behind. *Abdomen* with a conspicuous lamella or plate behind each hind coxa. Legs moderately stout; claws unarmed.

A genus of small beetles, whose species have the outlines of the head, prothorax, and elytra forming an almost continuous oval or ellipse. The species all live on or close to the ground, or in moss or fallen leaves; the typical species may be seen in myriads during floods in the Hawkesbury River; it has been known to me for many years, but was previously passed over owing to doubts as to its generic position; some specimens of it were sent to the late Rev. T. Blackburn for his opinion, and especially as to if he thought they represented an aberrant species of *Chalcolampra*. In reply he wrote:—"The small Chrysomelid cannot be placed near *Chalcolampra* on account of its front coxae open behind. It is very close to *Plagiodera*, but differs, *inter alia*, by the form of its elytral epipleurae, the smaller third joint of its tarsi, and the peculiar carina on its ventral segments. The third joint of its tarsi is unusually emarginate for a Chrysomelid, but this is the case also in *Plagiodera*. I cannot make its claws anything but simple, though I have had them under a microscope." The examination of several additional species has convinced me that a new genus is required for it, and although in its habits and general appearance (resembling, on a small scale, several of the more rounded species) it certainly appears to be allied to *Chalcolampra*, in the table of genera it is rather widely separated from same and associated with *Pseudoparopsis* (the genus proposed by Blackburn for the reception of the Australian species previously referred to *Plagiodera*). In the species where specimens have been available for destructive examination, the front coxal cavities are seen to be widely open behind, but normally the four front coxae are so close together that unless the prothorax be separated from the mesothorax it is

often difficult to be sure of this point. In *Chalcolampra*, for the entire width behind each of the front coxae, there is a narrow process whose narrowest portion is obliquely cleft; the process is fairly distinct on many of the larger species, but to see it clearly on some of the smaller specimens some manipulation is necessary. There is a curious marked-off division on each side of the abdomen behind the hind coxa, much as in many *Coccinellidae;* in that family they are sometimes called abdominal lamellae or plates, and the term, being a convenient one, I shall call them abdominal lamellae; smaller but somewhat similar lamellae are to be seen in the ground-frequenting species of *Chalcolampra*, but are practically absent from *18-guttata* and allied species; they are also present on *Cyclonoda*. The clypeal suture is sometimes represented by a distinct but scarcely-impressed line, but usually by a more or less distinct and isolated fovea on each side. The antennae vary from moderately short and with fairly-wide subapical joints to decidedly long and thin. There is a slight swelling about the base of each claw, but it does not appear to be in any way dentate, so that it must be regarded as simple. Typical species, *blackburni*.

GEOMELA BLACKBURNI, n. sp.

Black, with a coppery gloss; five or six basal joints of antennae, legs, and tip of abdomen more or less reddish.

Head with numerous distinct punctures between eyes and very feeble ones elsewhere; with a small round foveae on each side in front. Antennae slightly passing base of prothorax, first joint stout, third as long as fourth and fifth combined, seventh to eleventh rather wide, the seventh to tenth transverse. *Prothorax* more than thrice as wide as the median length, base gently sinuous; with conspicuous punctures on sides and across apex, but very minute elsewhere. *Scutellum* with rounded sides. *Elytra* with sides gently rounded and continuous with those of prothorax; with regular rows of fairly large punctures; interstices with minute punctures. Inter-coxal process of *prosternum* elevated and wedge-shaped in front. *Abdomen* with basal lamellae large, each with a narrow process projecting obliquely backwards and terminated some distance from apex of segment. Length, $2\frac{1}{2}$-3 mm.

Hab.—New South Wales: Windsor, Sydney; Victoria: Emerald; South Australia: Mount Gambier (A. M. Lea), Lucindale (B. A. Feuerheerdt). Type, I. 3393.

The abdomen is usually pale only at the tip, but sometimes the red is obscurely continued on the sides and towards the base; the sides of the elytra are also occasionally diluted

with red. The sexual differences, apart from a greater convexity of the abdomen in the female, are but slight.

Var. A. Four specimens from Windsor differ from the typical form in being of a dark metallic-green, with the femora rather deeply infuscate in middle and with a greenish gloss.

GEOMELA BIFOVEATA, n. sp.

Black, with a slight bronzy gloss, under-surface (including elytral epipleurae) more or less conspicuously diluted with red, appendages almost flavous, but apical half of antennae lightly infuscated.

Head with very small punctures; a fairly large but not sharply defined and somewhat oblique fovea close to the base of each antenna. Antennae moderately long and rather thin, first joint (excluding a short basal portion) globular, third slightly longer than fourth and fifth combined, the others gently increasing in width, but none transverse. *Prothorax* almost four times as wide at the base as the median length; with numerous small but distinct punctures, rather larger about base than elsewhere. *Elytra* with regular rows of fairly large punctures; the interstices with rather sparse and small but fairly distinct ones. Inter-coxal process of *prosternum* gently convex, dilated at each end. *Abdomen* with basal lamellae large and rounded posteriorly. Length, $3\frac{1}{4}$-$3\frac{1}{2}$ mm.

Hab.—Tasmania: Mount Wellington, in moss (H. H. D. Griffith), Hobart, in moss, Latrobe, in flood debris (A. M. Lea). Type, I. 5668.

From some directions the cephalic foveae appear to be feebly connected, but from most directions they seem to be completely isolated. The elytra are rather more convex and with the sides more strongly rounded than on *blackburni*.

A specimen, from the old collection, differs in having the cephalic foveae more pronounced, upper-surface almost without punctures (except for the seriate ones on elytra), but those on the abdomen rather more distinct, the antennae are distinctly longer and thinner, but the proportionate lengths of the joints are the same. It possibly represents a new species, but being without a locality label it is undesirable to describe it as such.

GEOMELA CIRCUMFLAVA, n. sp.

Black, with a coppery gloss; front of head, sides of prothorax and of elytra (including epipleurae), and a stripe on each side from apex almost to summit of apical slope on third interstice conspicuously flavous; under-surface dark reddish-brown, becoming paler outwardly; appendages more or less flavous.

Head with small and rather indistinct punctures; clypeal suture curved deep and non-foveate. Antennae rather long and thin, none of the joints transverse, third as long as fourth and fifth combined. *Prothorax* more than thrice as wide as long; with numerous minute punctures and a few of larger size irregularly distributed. *Elytra* with regular rows of fairly large punctures; the interstices with sparse and minute ones. Inter-coxal process of *prosternum* rather narrowly elevated in middle. Basal segment of *abdomen* with lamellae moderately large and rounded posteriorly. Length, 3 mm.

Hab.—South Australia: South Para Hills (J. G. O. Tepper). Type (unique), I. 3394.

The general outlines are much as those of *blackburni*, but the conspicuously flavous margins should render the species easy of recognition.

GEOMELA BRYOPHAGA, n. sp.

Blackish-brown or black, with conspicuous markings; under-surface variable in colour, appendages flavous or reddish-flavous, the knees infuscated.

Head with minute punctures. Antennae rather long and thin, third joint very little longer than fourth, eleventh about as long as ninth and tenth combined. *Prothorax* about four times as wide as long, base gently and evenly rounded; with irregularly distributed and rather minute punctures. *Scutellum* very small. *Elytra* with small and vaguely impressed punctures in feeble striae; the interstices impunctate. Inter-coxal process of *prosternum* rather narrowly elevated in middle. Basal lamellae of *abdomen* small and rounded posteriorly. Length, 2-2¼ mm.

Hab.—Tasmania: Mount Wellington, from moss and fallen leaves; Hobart, from moss (H. H. D. Griffith and A. M. Lea). Type, I. 5669.

The colour of the upper-surface varies from a dark piceous-brown to deep-black, with a slight metallic gloss; the head is more or less obscurely reddish, each front angle of the prothorax is flavous, the marking usually almost square and sharply limited (extending to about one-third from the base), but occasionally not sharply defined internally, the margins of the elytra are narrowly flavous, with the marking continued along the suture almost to the summit of the apical slope. On some specimens almost the whole of the under-surface is reddish or flavous, but the front angles of the prosternum and the elytral epipleurae are flavous on all those before me. From some directions the head appears to have a conspicuous median line, but it is really feeble; the clypeal suture, according to the point of view, appears very distinct,

very feeble, or represented by a small depression at each end. From some directions the prothorax appears to be feebly shagreened. The outlines of the elytra are continuous with those of prothorax, but more rapidly narrow to the apex than in all other species of the genus.

Oomela, n. g.

Eyes rather coarsely faceted. Antennae rather long, joints more or less filiform. Maxillary palpi short, apical joint briefly conical, the subapical joint distinctly wider. Epipleurae of elytra narrow, flat, or gently concave. Inter-coxal process of *prosternum* rather narrowly triangular in front, rather widely dilated and flat at base, with the middle feebly notched; front coxal cavities closed. *Legs* rather short; claws each with a rather large basal appendix.

A genus of small species, several of which at first sight appear to belong to *Paropsis*, but they are readily distinguished therefrom by the non-securiform palpi and elytral epipleurae not overhanging. The general characters are those of *Chalcolampra*, but the small size, oval outlines, and general appearance are very different to those of most species of that genus; the eyes, as a rule, are slightly less prominent and rather less coarsely faceted, and the outlines of the prothorax and elytra are more or less continuous (but so they are on some species of *Chalcolampra*); the inter-coxal process of the mesosternum is gently produced in the middle, fitting into a slight notch on the prosternal process, but unless the prothorax and mesothorax are separated both process and notch are difficult or impossible to be seen; the base of the prosternal process, however, is subtriangularly dilated on each side and flat, and level or almost level with the middle; in *Chalcolampra* the base is always depressed below the middle and more or less rounded, merging into the general sculpture instead of distinctly elevated above same. There are abdominal lamellae somewhat as in some species of *Geomela*, but smaller, so that it is necessary to force the hind legs aside to see them clearly. The front coxal cavities are each closed behind by a very narrow ridge; but when the prothorax and mesothorax are separated the lower parts of the front coxae are readily seen. Type of genus, *variabilis*.

Oomela variabilis, n. sp.

Reddish-castaneous, usually with some parts black or infuscate.

Head almost impunctate, a shallow depression close to each eye. *Prothorax* more than thrice as wide as long, sides

gently rounded and decreasing in width to apex; with small scattered punctures. *Elytra* at base very little wider than prothorax, sides gently rounded; with regular rows of rather small punctures, becoming much smaller posteriorly; interstices with very sparse punctures. Length, 3-4 mm.

Hab.—Queensland: Mount Tambourine (Henry Hacker and C. Wild); New South Wales: Acacia Creek (H. J. Carter). Type, I. 5684.

Of the eight specimens before me no two are exactly alike; but as two are almost alike, one of these has been selected as the type; its head is almost entirely black, with the apical two-thirds of antennae blackish; the elytra have the sides from the middle and the apex rather widely infuscated and with indications of a median fascia. One specimen has the head, prothorax (a fairly-distinct reddish spot towards each side excepted), apical two-thirds of elytra (a large, somewhat irregular, completely-enclosed spot on each excepted), and the legs black with a bluish gloss, the antennae are black, except a few of the basal joints. Another specimen is very similar, except that the legs are not so dark. Two specimens have the basal portion of head blackish, apical half of antennae and apical sides of elytra infuscated; with, on one of them, vague indications of remnants of a median fascia. Another specimen, except for a slight infuscation of the antennae, is entirely pale. The eighth specimen, except for its elytra, agrees with the preceding one, but the elytra are marked with ten conspicuous rounded spots: four near base, four just beyond the middle, and two near apex. There are small abdominal lamellae, but to see these clearly the legs must be pushed aside.

Oomela trimaculata, n. sp.

Bright reddish-castaneous, about three-fourths of antennae deeply infuscated, elytra with three conspicuous black spots: one, common to both, touching the scutellum, and a large obliquely oval one on each side beyond the middle.

Head scarcely visibly punctate. *Prothorax* at base fully four times as wide as long; with sparse and very minute punctures. *Elytra* with sides rather strongly rounded and widest at basal third; with rows of minute and rather distant punctures, the interstices impunctate or almost so. Length, $2\frac{1}{4}$-$2\frac{1}{2}$ mm.

Hab.—Queensland: Cairns district (Blackburn's Collection and A. M. Lea). Type, I. 3396.

Two specimens have elytral markings practically identical, but on a third they are reduced to infuscate stains and

somewhat differently placed, each elytron having an obscure stripe close to the suture behind (but not touching) the scutellum, and the stripe obscurely connected with remnants of the post-medio-lateral spot. The seriate punctures on the elytra are actually very small, but owing to "waterlogging" they appear to be of considerable size. The abdominal lamellae are small and usually concealed.

Oomela elliptica, n. sp.

Bright red or reddish-castaneous, elytra more or less black, with a slight metallic gloss, apical three-fourths of antennae rather deeply infuscated, middle of base of prothorax moderately infuscated.

Head with fairly numerous but shallow and ill-defined punctures, becoming denser and more distinct on clypeus. *Prothorax* almost four times as wide as long, sides rather strongly rounded in front; with numerous small punctures becoming more distinct (but not very large) about base. *Elytra* (except at extreme base) with outlines continuous with those of prothorax, sides almost parallel for most of their length; with regular rows of conspicuous but not very large punctures, becoming small posteriorly; interstices with very minute punctures. Length, $3\frac{1}{2}$-$3\frac{3}{4}$ mm.

Hab.—Northern Queensland (Blackburn's Collection), Cairns (E. Allen), Mount Tambourine (A. M. Lea). Type, I. 3397.

The three specimens before me differ somewhat in the colour of the elytra; on the type these appear to be deep black with a slight greenish gloss, but on close examination a portion about the middle appears to be very obscurely diluted with red; on the second specimen the greenish gloss is more evident and the paler median portion is fairly distinct; but on the third each elytron has a large, round, conspicuous red spot just before the middle. On the type the tibiae are rather strongly infuscated apically. The abdominal lamellae are very short. The general outlines are rather more elliptic than on most species of the genus.

Oomela pulchripennis, n. sp.

Bright red, apical two-thirds of antennae infuscated; elytra deep purple.

Head rather strongly convex, with a few small punctures in front and with a conspicuous depression in middle of clypeal suture. *Prothorax* about four times as wide as long, sides rather strongly rounded, but front angles slightly projecting laterally; with numerous rather small (but for the

genus fairly large) punctures. *Elytra* at base slightly wider than prothorax, sides gently rounded; with regular rows of fairly large punctures, becoming smaller posteriorly; interstices with very minute punctures. Length, 4 mm.

Hab.—Queensland: Cairns district (A. M. Lea). Type (unique), I. 2677.

Despite great superficial resemblance, on a reduced scale, of this species to *Stethomela purpureipennis*, it seems impossible to refer it to *Stethomela*, the apical joint of the maxillary palpi being so different. Under a Coddington lens the maxillary palpi appear to have the apical joint elongate-conical, but on closer examination the apical joint appears to be really very short, but continuing the lines of the subapical one. The hind femora are unusually stout (much as on many of the *Halticides*) and quite conceal the small abdominal lamellae.

EXPLANATION OF PLATES.

Plate XXXII.

Fig. 1. ... *Eutermicola sculpticollis*, Lea.
,, 2. ... *Phyllotocidium pictum*, Lea.
,, 3. ... *Eupsalis pictipennis*, Lea.
,, 4. ... *Gastrophacodes ventricosus*, Lea.
,, 5. ... *Uracanthus insignis*, Lea,
,, 6. ... ,, *dubius*, Lea, tips of antennae.
,, 7. ... ,, *fuscus*, Lea, tip of elytron.
,, 8 and 9. ,, *discicollis*, Lea, tip of elytron.
,, 10 and 11. ,, *pertenuis*, Lea, tip of elytron.
,, 12 ... ,, *parvus*, Lea, tip of elytron.
,, 13. ... ,, *tropicus*, Lea, tip of elytron.
,, 14. ... ,, *parallelus*, Lea, tip of elytron.
,, 15. ... ,, *lateroalbus*, Lea, tip of elytron.
,, 16. ... ,, *albatus*, Lea, tip of elytron.
,, 17. ... ,, *loranthi*, Lea, tip of elytron.
,, 18 ... ,, *suturalis*, Lea, tip of elytron.
,, 19 to 21. ,, *longicornis*, Lea, tip of elytron.
,, 22. ... ,, *simulans*, Pasc., tip of elytron.
,, 23 to 25. ,, *strigosus*, Pasc., tip of elytron.
,, 26 and 27. ,, *marginellus*, Hope, tip of elytron.
,, 28. ... ,, *pallens*, Hope, tip of elytron.
,, 29 and 30. ,, *bivittatus*, Newm., tip of elytron.
,, 31. ... ,, *acutus*, Blackb., tip of elytron.
,, 32. ... ,, *corrugicollis*, Lea, tip of elytron.
,, 33. ... ,, *glabrilineatus*, Lea, tip of elytron.
,, 34. ... ,, *ater*, Lea, tip of elytron.
,, 35. ... ,, *ventralis*, Lea, tip of elytron.
,, 36. ... ,, *inermis*, Lea, tip of elytron.

Plate XXXIII.

(Details of species of *Bolbocerus.*)

Figs. 37 to 42. *B. proboscideum*, Schreib, produced front of head.
,, 43 and 44. *B. armigerum*, Macl., front view of clypeus.
,, 45. ... *B. variolicolle*, Lea, front view of clypeus.
,, 46 and 47. *B. insigne*, Lea, front view of clypeus.
,, 48 and 49. *B. trifoveicolle*, Lea, front view of clypeus.
,, 50. ... *B. quinquecorne*, Lea, front view of clypeus.
,, 51. ... *B. dacoderum*, Lea, front view of clypeus.
,, 52 and 53. *B. taurus*, Westw., front view of clypeus.
,, 54 and 55. *B. contextum*, Lea, front view of clypeus.
,, 56. ... *B. pentagonicum*, Lea, front view of clypeus.
,, 57. ... *B. hoplocephalum*, Lea, front view of clypeus.
,, 58 and 59. *B.* ,, Lea, front view of clypeus and of cephalic horns.
,, 60. ... *B. pentagonicum*, Lea, back view of clypeus and ocular canthi,
,, 61. ... *B. bainbridgei*, Westw., head from above.
,, 62. ... *B.* ,, Westw., head and prothorax from the side.

Plate XXXIV.[34]

Figs. 63 to 70. *Leptops duponti*, Boi., variations, principally in size, of common form.
,, 71 to 73. ,, ,, Boi., var. *interioris*, Blackb.
,, 74. ... ,, ,, Boi., common form with pectoral armature (slight projection in front of front legs) showing.
,, 75. ... ,, ,, Boi., large specimen intermediate between common form and *interioris*.
,, 76. ... ,, ,, Boi., var. *obsoletus*, Lea.
,, 77 and 78. ,, ,, Boi., var., *carinatus*, Lea.

Plate XXXV.

Figs. 79 to 86. *Leptops nitidiventris*, Lea.
,, 87 to 89. ,, *pilulifer*, Lea.
,, 90. ... ,, *amplipennis*, Lea.
,, 91 and 92. ,, *muricatus*, Pasc.
,, 93 and 94. ,, *pilulifer*, Lea, varieties.

Plate XXXVI.

Figs. 95 to 97. *Leptops biordinatus*, Blackb.
,, 98 to 104. ,, ,, var. *raucus*, Blackb.
,, 105 to 110. ,, *gravis*, Blackb.

[34] Plates xxxiv. to xxxix. are from photographs by Mr. H. Hale, of the South Australian Museum.

PLATE XXXVII.

Figs. 111 to 122. *Leptops areolatus*, Blackb. (fig. 112 type of species; fig. 111 type of var. *rudis*, Lea; fig. 114 type of var. *frenchi*, Lea).
,, 123 to 126. ,, *browni*, Lea.

PLATE XXXVIII.

Figs. 127 to 132. *Leptops contrarius*, Blackb.
,, 133. ... ,, *acerbus*, Pasc. (?)
,, 134. ... ,, ,, Pasc.
,, 135 to 137. ,, *colossus*, Pasc.
,, 138 to 140. ,, *echidna*, W. S. Macl. (fig. 139 co-type of *planicollis*, Blackb.).
,, 141 and 142. ,, *hercules*, Lea.

PLATE XXXIX.

Figs. 143 to 145. *Leptops elongatus*, Lea (fig. 144 type, figs. 143 and 145 described varieties).
,, 146 to 148. ,, *parvicornis*, Lea.
,, 149 and 150. ,, *nitidicollis*, Lea.
,, 151 to 153. ,, *duboulayi*, Pasc.
,, 154 and 155. ,, *cacozelus*, Lea.
,, 156 to 158. ,, *ferus*, Pasc. (the real *tribulus*, Fab.).

Additions to the Fish-fauna of Lord Howe Island. No. 5.[1]

By Allan R. McCulloch, Zoologist, Australian Museum, and
Edgar R. Waite, F.L.S., Director, South Australian Museum.

[*Contribution from the Australian and South Australian Museums.*]

[Read September 14, 1916.]

Plates XL. to XLIII.

Since the "Catalogue of the Fishes of Lord Howe Island" was published,[2] a number of new and otherwise interesting species have been forwarded by residents of the island. Some of these are dealt with in the following pages, together with a small collection which was recently obtained for the South Australian Museum by Mr. A. M. Lea during a collecting expedition to Norfolk and Lord Howe Islands. We have also again examined some specimens of which the earlier identifications appeared incorrect, and submit additional notes upon them.

Much of this material has been forwarded at intervals to the Australian Museum by Mrs. Thomas Nichols, who has contributed so much to our knowledge of the island fauna. Other striking species were secured by Mr. P. R. Pedley, who is also interesting himself in the fauna of the island.

Family LEPTOCEPHALIDAE.

Genus Congermuraena, Kaup.

Congermuraena, Kaup.: Cat. Apod. Fish. Brit. Mus., 1856, p. 108 (*C. habenatus*, Richardson); Ogilby: Proc. Linn. Soc. N.S. Wales, xxiii., 1898, p. 284.

This genus apparently differs from *Leptocephalus* only in having granular instead of sharp vomerine teeth, and in having the muciferous system of the head rather more developed. The dorsal fin originates well forward above the head or just behind the vertical of the pectoral fin, but this condition is not a generic character, since the fin commences equally far forward in some species of *Leptocephalus*.

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[1] For No. 4 see Waite: Rec. Austr. Mus., v., pt. 3, 1904, p. 135.

[2] Waite: *loc. cit.*, p. 187.

Congermuraena howensis, n. sp.

Pl. xl. fig. 2.

Congermuraena mellissii, Ogilby: Mem. Austr. Mus., ii., 1889, p. 72 (not *C. mellissii*, Günther).

Congrellus gilberti, Ogilby: Proc. Linn. Soc. N.S. Wales, xxiii., 1898, p. 288 (part, Lord Howe Island specimens); Waite: Rec. Austr. Mus., v., 1904, p. 189.

Head 1·5-1·6 in the trunk. Head and trunk 1·2-1·4 in the tail. Eye 1·3-1·4 in the snout, and 4·9-5·7 in the head. Snout 3·4-4·3, pectoral 3·0-3·3, and depth of body 2·7-3·2 in the head.

Body somewhat compressed, the head and trunk shorter than the tail. Head large, conically pointed anteriorly. Snout longer than the eye, and projecting beyond the lower jaw. Eyes large, separated by a narrow interorbital space. Gape of mouth extending backward almost to below the middle of the eye, with distinct but not fleshy lips. Anterior nostril in a short tube near the margin of the mouth; snout with large open pores with raised margins. A series of widely-spaced pores crosses the upper-surface of the head behind the eyes to beyond the angle of the mouth, where it divides, one branch following the upper lip while the other extends along the mandible; a second series crosses the nape and curves downward behind the preopercular portion of the head. *Teeth*.—Premaxillary teeth acicular, slender, and acute, and arranged in several rows. Maxillary teeth similar, in three or four rows anteriorly, becoming uniserial posteriorly. Anterior vomerine teeth acicular, becoming granular on the shaft, where they are arranged in two or three irregular rows; they do not extend backward to the vertical of the anterior margin of the eye. Mandibular teeth acicular, in several rows anteriorly, becoming uniserial posteriorly; the inner ones are smaller, stouter, and more granular than the others.

Fins.—Dorsal commencing well in front of the gill-opening. Pectoral slender, with about fourteen rays, the upper of which are longest.

Lateral line commencing on the operculum, slightly arched anteriorly, thence gradually descending to the median line of the body.

Colour.—Brown in alcohol, light-olive in formaline. Head with distinct darker cross-bands; the first covers the snout, but leaves the nostrils and larger pores and the lips white; the second crosses the interorbital space and forms a dark patch beneath the eye; the third extends across the nape and preopercular portion of the head; and the fourth crosses the neck and opercles. Dorsal, anal, and caudal fins with narrow black borders.

Described from three specimens 143, 283, and 347 mm. long; the smaller, being preserved in formaline and exhibiting characters not shown in the larger spirit specimens, is figured. They apparently differ from all described species of *Congermuraena* in having the dorsal fin originating over the operculum.

Loc.—Lord Howe Island.

Family LABRACOGLOSSIDAE.

Genus Labracoglossa, Peters.

Labracoglossa nitida, n. sp.

Pl. xli., fig. 2.

D. x. 26-28; A. iii. 23-24; P. 21-22; V. i. 5; C. 17; L. lat. 72-75; L. tr. 10-11, 19.

Depth 3·3 in the length to the hypural joint; head 3·9 in the same. Eye slightly longer than the snout, 4·0 in the head. Interorbital width greater than the diameter of the eye, equal to that of the orbit and 3·2 in the head. Median dorsal spines subequal to the anterior dorsal and anal spines, 2·4 in the head.

Body fusiform, moderately compressed, the upper and lower profiles almost equally convex. Snout rather obtuse; nostrils close together, small, sublateral, placed near the orbital margin. Eye partly covered by a thick adipose lid, situated in the anterior half of the head. Mouth oblique, the maxillary reaching back to below the anterior portion of the pupil. Preorbital narrow, entire, not covering the maxillary. Preoperculum broadly rounded, the surface of its border striated, the striae forming fine crenulations on its margin. Operculum with a very small spine.

Teeth.—A single row of short conical teeth in the upper jaw, behind which is a band of microscopic ones anteriorly on each side of the symphysis. Mandible with a band of minute teeth anteriorly, merging into a single series of small stout teeth on the sides. A large patch of microscopic teeth covers the head of the vomer, from each side of which a narrow band extends backward on the palatines: commencing evenly with the termination of the latter is a very broad, elongate band on each mesopterygoid. Tongue largely covered by a broad patch of similar teeth. Gill-rakers long and slender, about twenty-six on the lower limb of the first arch: the longest two-thirds as long as the snout.

Scales cover the greater part of the head, extending forward to the nostrils: they are present on the cheeks, opercles, and lower jaw, and a few occur on the maxillary. Body covered with rather small, ctenoid scales, which have broad

rough margins, and their exposed surfaces coarsely striate. They form a low sheath at the base of the spinous dorsal, and cover the membranes of the soft dorsal and anal: they also extend over the basal half of the caudal, and portion of the pectoral. Lateral line scarcely arched, formed of simple tubercles, which extend on to the caudal base.

Fins.—Dorsal commencing well behind the vertical of the ventral. Its spines are slender, and increase rapidly in length to the fifth, after which they become slightly shorter to the last: the dorsal rays decrease regularly in length backward. Anal commencing beneath the third dorsal ray; its spines increase in length backward, the third being two-thirds as long as the first ray; soft anal similar in form to the dorsal. Caudal deeply forked. Fifth upper pectoral ray longest. Ventrals not nearly reaching the vent.

Colour.—After long preservation in formaline, the general colour is brown above, lighter below. A light-coloured area commences above the shoulder and extends backward to the caudal fin, and covers the greater part of the back above the lateral line. It is defined anteriorly and below by a dark-bluish area, which commences behind the eye. Dorsal and anal fins dusky, the latter with a light edge. An ill-defined dark spot at the base of the pectoral.

Described from five specimens, 134-154 mm. long measured from the snout to the end of the middle caudal rays. They differ from *L. argenteiventris*, Peters, in having smaller scales and ten instead of eleven dorsal spines.

Loc.—Four of the specimens were collected for the Australian Museum by Mrs. T. Nichols at Lord Howe Island. The other was secured at Norfolk Island by Mr. George E. Nobbs.

Family LUTIANIDAE.

Genus Paracaesio, Bleeker.

Paracaesio pedleyi, n. sp.

Pl. xlii.

D. x. 10; A. iii. 8; P. 17; V. i. 5; C. 17; L. lat. 71; L. tr., from first dorsal spine, 10, 1, 20.

Head 3·6, and depth of body 2·9 in the length to the hypural joint. Eye almost as long as the snout, 1·5 in the interorbital space, and 4·0 in the head. Interorbital space 2·5, snout 3·6, and depth of caudal peduncle 3·0 in the head. Third dorsal spine 1·4 in the head, and 1·3 longer than the last. Penultimate dorsal ray 2·0, third anal spine 3·3, and penultimate anal ray 2·1 in the head. Pectoral 0·1 longer than the head.

Body moderately elongate, compressed, the dorsal and anal profiles almost evenly rounded. Head tumid, the interorbital space high and arched. Eye a little above the middle line of the head. Maxillary reaching backward to below the anterior portion of the eye, only partly covered by the preorbital, which is entire and not so broad as the maxillary. Preopercular margin sinuous but not serrated, the hinder limb subvertical, the angle rounded. Operculum with a flat spine. Nostrils minute, close together, midway between the anterior margin of the eye and the tip of the snout.

Teeth.—Premaxillaries with several short stout canines anteriorly and on the sides, which are followed by a narrow band of villiform teeth. Mandible with a few canines anteriorly and a band of villiform teeth. Vomer with a small patch of villiform teeth: similar teeth are also present on the anterior portions of the palatines. Tongue smooth.

Scales cycloid, of moderate size, largest on the anterior portion of the sides. They extend forward on the upper surface of the head to above the anterior portion of the eye: thence they are defined by a series curving backward to the suprascapular, which is covered with small muciferous canals. Some large scales are placed on the sides of the nape and are connected with those on the cheeks and opercles. Seven rows on the cheeks, leaving a broad area on the limb of the preoperculum naked. All the rest of the head naked, the skin on the snout and upper part of the head pitted with minute pores. Small scales cover the base of the pectoral fin and a large part of the caudal, but they are not present on the membrane of the dorsal and anal fins. Lateral line but little arched, extending on to the middle of the caudal peduncle, and consisting of simple tubules.

Fins.—Dorsal originating slightly behind the vertical of the ventrals; the third spine is the longest, and with these on each side of it forms an elevated lobe; the posterior spines are subequal in length and scarcely shorter than the first rays: the rays increase in length backward to the second last. Anal originating below the anterior part of the soft dorsal and terminating a little behind it: the first spine is short, the second and third subequal and as long as the anterior rays. Pectoral falcate, reaching to the vertical of the first anal spine. Caudal strongly forked.

Colour.—General colour cerulean-blue and lemon-yellow. The yellow colour covers the tail and greater portion of the caudal peduncle, and extends forward on the supralateral portion of the body to a point in advance of the origin of the dorsal. The anterior part of the body is blue, and this colour extends backward along the back below the dorsal fin, and

on the side to the lower base of the caudal. Abdominal surface silver shot with blue. Head dark above, light-blue on the cheeks and opercles. A dark band crosses the body between the middle of the spinous dorsal and the abdomen, which consists largely of the very broad blackish margins to the scales. Spinous dorsal dark, the membrane between its fourth and ninth spines being almost black; soft dorsal dusky anteriorly, becoming lighter backwards. Anal hyaline-blue, pectorals hyaline, ventrals bluish-white basally, the rays becoming blackish towards the tips.

Described and figured from a specimen 336 mm. long from the snout to the end of the middle caudal rays. It was collected by Mr. P. R. Pedley, to whom the Trustees of the Australian Museum are indebted for many valuable specimens.

This species has the general characteristics of *P. xanthurus*, Bleeker,[3] but may be at once distinguished by the form of the spinous dorsal and by the distribution of its colours.

Family KYPHOSIDAE.

Genus Kyphosus, Lacépède.

Kyphosus fuscus (Lacépède), Günther.

Pimelepterus fuscus, Günther: Jour. Mus. Godeff., ii., 1873, p. 68.

Four specimens are preserved in the Australian Museum from Lord Howe Island and two from Norfolk Island. One of the latter is an incipient albino, being of a light-yellow colour instead of dark-brown, with darker yellow stripes along each row of scales. It is perhaps identical with the "Guinea-fish" of Lord Howe Island, which has been very rarely observed.[4]

Family SCORPIDIDAE.

Genus Atypichthys, Günther.

Atypichthys latus, n. sp.

Pl. xl., fig. 3.

D. xi.-xii. 14-15; A. iii. 13-15; P. 15-16; V. i. 5; C. 17.

Scales in 70-75 rows between the suprascapular and the hypural joint; 12-13 scales between the lateral line and the middle of the spinous dorsal, excluding the dorsal sheath. Depth 2·04-2·1 in the length to the hypural joint; head 3·2-3·4 in the same. Eye longer than the snout, 2·5-2·8 in the head. Snout 1·2-1·5 in the eye, and 3·5-4·0 in the head; its length is

[3] Bleeker: Res. Faun. Madagascar, Poiss., 1878, p. 37, pl. xi.

[4] Waite: Rec. Austr. Mus., v. 3, 1904, p. 167.

a little less than the interorbital width, which is 2·9-3·5 in the head. Fifth dorsal spine 1·6-1·8, and second anal spine 1·8-2·1 in the head.

Colour.—Yellow, with six broad longitudinal brown stripes on the body; on the upper half these are much broader than the light interspaces, and in large specimens the three upper ones may each be divided into two. Head with similar stripes, most of which do not connect with those of the body, being separated from them by a light transverse bar on each side of the nape.

This species is very similar to *A. strigatus*, Günther, but is deeper, and has usually twelve instead of eleven dorsal spines. The stripes on the body are broader, and an extra one is developed in *A. latus*, while they are not all connected with those of the head, as in *A. strigatus*. In all other details, the two species are very similar.

This definition is drawn up from four specimens in the Australian Museum collection, 105-218 mm. long from the snout to the end of the middle caudal rays. A specimen 212 mm. in length is selected as the type.

Loc.—The two smaller examples, including that figured, were obtained at Norfolk Island, where Mr. Lea also took specimens, while seven larger ones were secured at Lord Howe Island, together with examples of *A. strigatus*.

Scorpis violaceus, Hutton.

Hard-bellied Blue Fish.

Ditrema violacea, Hutton: Trans. N. Zeal. Inst., v., 1873, p. 261, pl. viii., fig 31*b*.

Scorpis aequipinnis, Ogilby: Mem. Austr. Mus., ii., 1889, p. 56; Ogilby: Proc. Linn. Soc. N.S. Wales, (2), ii., 1887, p. 992; Waite: Trans. N. Zeal. Inst., xlii., 1910, p. 381 (not of Richardson).

Caesiosoma aequipinnis, Waite: Rec. Austr. Mus., v., 1904, pp. 167, 206.

An examination of a series of specimens of *Scorpis* shows that several well-differentiated species have been united under the name *S. aequipinnis*. Richardson's species has very small scales, there being more than 100 series above the lateral line, and it is confined to South and South-western Australia. The New South Wales form is *S. lineolata*, Kner., while specimens from Lord Howe Island and Norfolk Island are apparently referable to *S. violaceus*. Larger specimens of the last-named species are readily distinguished from those of *S. lineolata*, by their much more convex interorbital area and their smaller eye, while seven specimens have x. 27-29 spines and rays in the dorsal fin, and iii. 25-27 in the anal.

Family POMACENTRIDAE.

Genus Glyphisodon, Lacépède.

Glyphisodon sordidus, Forskal.

Pl. xl., fig. 1.

Chaetodon sordidus, Forskal: Descr. Anim., 1775, p. 62.

Glyphidodon leucopleura, Day: Fish. India, 1877, p. 385, pl. lxxxiii., fig. 4.

Glyphidodon sordidus, Waite: Mem. Austr. Mus., iii., pt. 3, 1897, p. 192.

D. xiii. 16; A. ii. 15-16; P. 19; V. i. 5; C. 15; L. lat. 22; L. tr. $4\frac{1}{2}$, 1, 14.

Twenty-eight scales between the operculum and the hypural joint, and three and a half between the back and the lateral line below the median dorsal spines. Body short and deep, narrower in the young, its depth 1·6-1·8 in the length to the hypural joint; head 2·6-2·8 in the same. Eye 2·5-3·3 in the head. Fifth dorsal spine 1·7-1·9, fourth dorsal ray 1·4-1·7 in the head.

Body with five dark cross-bands, which are broader than the interspaces between them. The first is indistinct, and crosses the back before the dorsal fin. The second and third descend from a large black blotch on the dorsal fin which covers the membrane between the second and seventh spines; these bands are darker than the others, and may be coalescent on the back. The fourth band is placed below the tenth to twelfth spines, and the fifth below the anterior rays. A large, rounded, black spot on the upper anterior portion of the caudal peduncle extends forward a little below the posterior dorsal rays. Upper base of the pectoral fin with a distinct black spot. Outer ventral ray dusky, as is the anterior portion of the soft dorsal and the greater part of the anal.

The above definition is based on three specimens 34, 45, and 74 mm. long, the largest of which is figured. They are apparently identical with *G. sordidus*, Forskal, having the body short and deep, with $3\frac{1}{2}$ series of supralateral scales, and a striking black spot on the caudal peduncle, features which are characteristic of that species.

Synonymy.—A critical comparison of these specimens with one of the types of *G. leucopleura*, Day, which is preserved in the Australian Museum, convinces us that they are identical with that species also. Day's example is only 36 mm. long, and is in very bad condition, but sufficient of its characters are retained to leave no doubt of its authenticity; it agrees much better with his description than with his figure, however, and suggests the latter is inaccurate in both the form of its fins and the disposition of its colour-marking. Day has described a "dark, almost black, band from the first half of

the dorsal fin descending to the ventral," but this is apparently formed of the second and third bands, which, as our specimens show, are sometimes partly united and darker than the others.

Loc.—Our smallest example (34 mm.) was collected in a rock-pool at Lord Howe Island.[5] Mr. Lea obtained seven specimens at Norfolk Island. Another (45 mm.) was secured at Funafuti, Ellice Group. Two others, including the largest figured specimen (74 mm.) were obtained in the New Hebrides.

Family LABRIDAE.

Genus Thalassoma, Swainson.

Thalassoma purpureum, Forskal.

Julis trilobata, Ogilby: Mem. Austr. Mus., ii., 1889, p. 68; *Thalassoma trilobatum*, Waite: Rec. Austr. Mus., v., 1904, pp. 171, 209 (not *Labrus trilobatus*, Lacépède).

Julis purpurea (Forskal), Günther: Jour. Mus. Godeff., xvi. (Fische der Südsee, viii.), 1909, p. 272, pl. cxlix., fig. *a*; *Thalassoma purpureum*, Jordan and Evermann: Bull. U.S. Fish. Comm., xxiii., 1, 1905, p. 295.

Julis umbrostigma (Rüppell), Günther: *loc. cit.*, p. 294, pl. cxlix., fig. *b*; *Thalassoma umbrostigma*, Waite: Rec. Austr. Mus., iv., 1901, p. 41; Jordan and Evermann: *loc. cit.*, p. 300, fig. 129.

The fishes recorded by Ogilby and Waite from Lord Howe Island as *T. trilobatum* are properly referable to *T. purpureum*. *Labrus trilobatus*, Lacépède, is regarded as synonymous with *L. fuscus*, Lacépède, by Jordan and Evermann, which differs from *T. purpureum* in having no scarlet markings on the head.

The identity of *T. umbrostigma* and *T. purpureum* has been suggested by both Klunzinger and Günther, while Waite has shown that they are merely growth stages of the one species.

T. purpureum is abundant on the reefs at Lord Howe Island, while a Norfolk Island example is preserved in the Australian Museum.

Family CHEILODACTYLIDAE.

Genus Cheilodactylus, Lacépède.

Subgenus Goniistius, Gill.

Cheilodactylus (Goniistius) ephippium, n. sp.

Pl. xliii., fig. 2.

D. xvii. 32-33 : A. iii. 8 : P. 8, 5-6 : V. i. 5 : C. 15 : L. lat. 62-64 ; L. tr. 9, 1, 19.

[5] It has been incorrectly recorded as *G. brounriggii*, Waite: Prelim. Rept. Thetis Exped., 1898, p. 61.

Supralateral scales $7\frac{1}{2}$. Depth of body 2·7-2·9 in the length to the hypural joint: head 3·1-3·4 in the same. Eye much shorter than the snout, slightly broader than the interorbital space, and 4·2 in the head. Fourth dorsal spine 2·5-2·6, second dorsal ray 2·9-3·08, second anal ray, 1·5-1·6, and longest pectoral ray 1·2-1·3 in the head.

Body compressed, elevated anteriorly. Profile from the snout to the back very oblique, slightly convex on the snout; the nape obtusely keeled. A bony tubercle is present on each side of the snout anteriorly, and another larger one is placed before each eye. Orbit defined above by a granular ridge, and by four granular ossicles which encircle the posterior and inferior margins of the eye. Nostrils large, close together, the anterior with fimbriate margins. Lips very thick, the upper overhanging the lower. Maxillary narrow, extending backward to below the nostrils. Preorbital and preoperculum entire; operculum with a small flat spine. A band of small, cardiform, depressible teeth in each jaw; palate toothless. Body covered with moderately large scales, the exposed surfaces of which are minutely granular. They form sheaths at the bases of the dorsal and anal fins, and extend on to the caudal and pectoral fins. They are very small on the head and breast, and extend forward to between the nostrils on the upper-surface of the head. Lateral line slightly arched, extending over the upper part of the caudal peduncle to the middle of the caudal fin: it is formed of simple tubules placed on small scales, which are intercalated with the others.

Fins.—Dorsal originating above the operculum; the spines increase rapidly in length to the fourth, whence they decrease evenly backward, leaving the margin of the fin not or scarcely excavate. The anterior rays are much longer than the last spine; the others decrease regularly backward to the last. Anal short, falcate, its hinder margin incised. Longest simple pectoral ray not greatly produced, not reaching so far back as the adpressed ventrals, which reach nearly or quite to the vent. Caudal forked.

Colour.—Light-brown in formaline with oblique darker cross-bands. An indefinite dark bar extends from the nape to behind the operculum; a second broad band extends obliquely backward from the anterior third of the spinous dorsal to the middle of the side; a third covers the greater part of the remainder of the back, and encloses three large light spots below the soft dorsal. A blackish mark surrounds the eye and extends forward on to the snout: sides of head with dark reticulating lines enclosing lighter spots. Breast and caudal fin with some very indefinite greyish ocelli. Spinous dorsal blackish, the soft portion with a median lighter

band. Anal, pectorals, and ventrals blackish, lighter in the larger specimen.

Described from two specimens 290 and 348 mm. long from the snout to the end of the middle caudal rays, the smaller of which is figured and is selected as the type. They are closely allied to several of the species of *Cheilodactylus* which have more than thirty dorsal rays, but the disposition of their colour-marking distinguishes them from all.

Loc.—The larger example was obtained at Lord Howe Island by Mrs. T. Nichols, while the other was secured by Mr. E. Allen at Norfolk Island.

Family AMMODYTIDAE.

Genus Bleekeria, Günther.

Bleekeria, Günther: Brit. Mus. Cat. Fish., iv., 1862, p. 387 (*B. kallolepis*, Günther); Jordan: Proc. U.S. Nat. Mus., xxx., 1906, p. 716.

This genus apparently differs from *Ammodytes* only in having no free longitudinal fold of skin along each side of the ventral surface. A critical comparison of the specimen described below with European examples of *A. tobianus*, Linnaeus, fails to reveal any other generic differences.

Bleekeria vaga, n. sp.

Pl. xliii., fig. 1.

Br. vii.; D. 48; A. 22; P. 16; C. 15; L. lat. 107 + 5; L. tr. 13, 1, 18.

Head, from the premaxillary symphysis to the end of the opercular lobe, 4·3 in the length to the hypural joint. Depth of the body 2·1 in the head. Eye a little wider than the bony interorbital width, half as long as the snout, and 6·8 in the head. Pectoral fin 2·5, fourth dorsal ray 4·5, and third anal ray 3·2 in the head.

Body subcylindrical, a little compressed, thickest in the middle of its length and tapering at each end. Snout pointed, the mandible projecting and conical anteriorly. Maxillary reaching to below the anterior margin of the eye, pointed behind, and entirely hidden by the preorbital. Lips broad. Nostrils minute simple openings, supero-lateral. Eye with a well-developed adipose lid. Angles of the preoperculum and operculum expanded into broad lobes, which are produced backwards. Head naked, with a subcutaneous muciferous system opening into minute pores, which are largest on the limb of the preoperculum. Jaws and palate without teeth; a large bony knob at the symphysis of the premaxillaries, and a smaller one on the mandible. Gill-openings very wide, the membranes free from the isthmus,

and the slit between them extending forward to below the eye. No longitudinal skin-fold on the side of the abdomen. A skinny, pointed lobe behind the operculum above the base of the pectoral: vent well behind the middle of the body, with a rounded flap covering the urinogenital orifice.

Scales.—Body covered with scales, which are largely rudimentary and enveloped in skin-folds extending obliquely across the body. A longitudinal row at the base of the dorsal fin is differentiated from the following two or three between it and the lateral line; the row directly above the lateral line is marked with a vertical tubule on each scale posteriorly, but the tubules become small and interrupted, and finally disappear anteriorly. Scales of the sides completely enveloped in the skin-folds, those of the ventral surface free. Scales cover the base of the caudal fin and extend up between the rays. Lateral line formed of simple tubes extending over 107 scales, subparallel with the back for the greater part of its length, and terminating on the upper part of the caudal peduncle.

Fins.—Dorsal and anal fins placed in shallow grooves. Dorsal originating behind the base of the pectoral and formed of slender, subequal rays, most of which are bifurcate; the third and fourth are higher than those immediately following them, but the succeeding ones gradually increase in length again. Anal originating about midway between the base of the pectoral and the end of the caudal fin, and terminating well behind the end of the dorsal; its third ray is the longest, the next two or three decrease rapidly, and succeeding ones become gradually shorter. Pectoral pointed, the fourth upper ray longest; it can be received into a depression in the side when adpressed. Caudal deeply forked.

Colour.—Uniform sandy-yellow in formaline, the opercles blackish.

Described and figured from a specimen 166 mm. long. It is closely allied to *B. gilli*, Bean,[6] and may be identical with that species, but has 112 instead of 97 scales between the origin of the lateral line and the hypural joint, and 3, 1, 18 across the middle of the body instead of 3, 14 transverse rows.

Loc.—Lord Howe Island; collected for the Trustees of the Australian Museum by Mrs. Thomas Nichols. The *habitat* of *B. gilli* is unknown, but the specimens on which the species was founded were supposed to have been collected in the Pacific by Dr. Stimpson.

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[6] Bean: Proc. U.S. Nat. Mus., xvii., 1895, p. 629.

Family BLENNIIDAE.

Genus GILLIAS, Evermann and Marsh.

Gillias, Evermann and Marsh: Rept. U.S. Fish. Comm., xxv., 1899, p. 357 (*G. jordani*, Everm. and Marsh).

This genus is usually regarded as synonymous with *Tripterygion*, Risso, but it apparently differs in having the head more or less scaly, while scales cover the abdomen and breast.

GILLIAS SQUAMICEPS, n. sp.

Pl. xli., fig 1.

Tripterygion nigripenne, Waite: Rec. Austr. Mus., v., pt. 3, 1904, pp. 182, 224 (not *T. nigripenne*, Cuv. and Val.).

D. iv. xv. 11-12; A. 22-23; P. 8-9+7-8; V. 2; C. 13; L. lat. 21-24; Scales 34-36; L. tr. $2\frac{1}{2}$, 1, 7.

Head 2·9-3·4 in the length to the hypural joint. Eye longer than the snout, 3·1-3·3 in the head. Snout 1·1-1·2 in the eye. Depth 1·5-1·7 in the head.

Body elongate, tapering from the head to the caudal peduncle. Head pointed anteriorly, subcylindrical posteriorly. Snout conical, the jaws equal. Mouth slightly oblique, the maxilla expanded posteriorly and reaching almost to below the middle of the eye. A small nasal tentacle, and a larger branched one on the upper portion of the eye.

Teeth in broad bands in both jaws anteriorly, becoming uniserial laterally, the outer row enlarged, curved, cardiform: a curved row of minute teeth on the vomer, the rest of the palate apparently toothless.

Scales extending forward to the hinder orbital borders on the upper-surface of the head and on to the opercles and cheeks below, where they are arranged in about five rows: in the smallest specimen the cheeks are naked. Rows of minute, spine-like cilia are present around the orbital margins, across the nape, and on the preopercular and suprascapular margins; these are most developed in the largest specimen. Entire body, including the abdomen, breast, and pectoral base, covered with large, strongly ctenoid scales. The lateral line is almost straight and extends to the vertical of the anterior dorsal ray. It is separated by two series of scales from the median row on the side of the tail; each of these has its margin excavated into a deep notch, the notches extending forward a varying distance in advance of the end of the lateral line. There are $2\frac{1}{2}$ scales between the lateral line and the back, and 7 between it and the anal fin.

Fins.—First dorsal commencing just behind the vertical of the preoperculum: the first spine is the longest, the others decreasing backwards. Second dorsal originating behind the

base of the pectoral; its spines increase in length to the eighth or ninth, and then decrease again. The third dorsal is highest anteriorly and is composed of simple rays. Anal fin much longer than the second dorsal and formed of simple rays, which are curved and thickened towards their tips; they increase in length to about the twentieth, and the last is behind the vertical of the hinder dorsal ray. Pectoral large, the longest upper simple ray reaching well beyond the origin of the anal; the six or seven lower rays are simple and thickened, those above them are bifid. Ventrals jugular, each consisting of two simple free rays, the inner of which is the longest. Caudal rounded, the two outer rays of each side simple, the others bifid.

Colour.—Light-grey in alcohol, each scale with a dark margin of microscopic black dots; five dark cross-bars descend from the back to the middle of the sides, where they divide into irregular intermediate bands on the lower half of the body. A broad dark bar crosses the cheek from the eye, and there are several less definite ones crossing the lips. Anterior dorsal almost black, second and third dorsals crossed by irregular dark oblique bars. Anal with about eleven dark spots at its base, from which oblique bars extend on to the fin; a broad white marginal band. Pectorals and caudal with numerous irregular brownish cross-bars.

Described from three specimens 25-55 mm. long, the largest of which is figured and is selected as the type. Two of these are the specimens which were doubtfully recorded by Waite as *T. nigripenne*, but his recent paper upon some species of *Tripterygion* [7] proves that they cannot be identified with that species. They are allied to *G. striaticeps*, Ramsay and Ogilby,[8] but consistently differ in the increased number of spines in the first and second dorsal fins.

Loc.—The two larger examples were collected at Lord Howe Island, and the smallest at Norfolk Island, taken by Mr. A. M. Lea.

Family TETRAODONTIDAE.

Genus Spheroides, Dumeril.

Spheroides altipinnis, Ogilby.

Tetrodon altipinnis, Ogilby: Rec. Austr. Mus., i., pt. 6, 1891, p. 110.

Amblyrhynchotus oblongus, Waite: Rec. Austr. Mus., iii., 1900, p. 207 (not *Tetrodon oblongus*, Bloch.).

Tetraodon hypselogeneion, Waite: *loc. cit.*, v., 1903, p. 38 (not *Tetraodon hypselogencion*, Bleeker).

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[7] Waite: Rec. Canterb. Mus., ii., pt. 1, 1913, p. 1.

[8] Ramsay and Ogilby: Proc. Linn. Soc. N.S. Wales, (2), iii., 1888, p. 419.

Spheroides altipinnis, *S. oblongus*, and *S. hypselogeneion*, Waite: *loc. cit.*, v., 1904, p. 218.

Tetrodon pleurogramma, Regan: Proc. Zool. Soc., 1902 (1903), ii., p. 300, pl. xxiv., fig. 2.

Spheroides pleurogramma, McCulloch: Rec. W. Austr. Mus., i., 1904, p. 227.

The typical specimen of *S. altipinnis* is in the Australian Museum collection: it is stuffed and in very poor condition, but such of its characters as are retained indicate that it is the adult form of the species described and figured by Regan as *S. pleurogramma*. A series of specimens of different sizes shows that the colour-markings change with growth, larger examples losing the dark lateral band and the cheek-markings which are characteristic of younger specimens. According to Ogilby's description, the type had no lateral fold on the tail, but this appears to be incorrect.

Waite recorded these adult and young forms from Lord Howe Island as *S. oblongus*, Bloch, and *S. hypselogeneion*, Bleeker; but the species bears little resemblance to the former, while according to Regan it also differs from the latter.

Loc.—The Australian Museum includes specimens from near Sydney, New South Wales; Moreton Bay, Queensland; and Lord Howe Island. The South Australian Museum possesses an example taken by Mr. Lea at Norfolk Island.

EXPLANATION OF PLATES.

Plate XL.

Fig. 1. *Glyphisodon sordidus*, Forskal. A specimen 74 mm. long, from the New Hebrides.
,, 2. *Congermuraena howensis*, n. sp. A specimen 143 mm. long, from Lord Howe Island.
,, 3. *Atypichthys latus*, n. sp. A specimen 128 mm. long, from Norfolk Island.

Plate XLI.

Fig. 1. *Gillias squamiceps*, n. sp. Type, 55 mm. long, from Lord Howe Island.
,, 2. *Labracoglossa nitida*, n. sp. Type, 157 mm. long, from Lord Howe Island.

Plate XLII.

Paracaesio pedleyi, n. sp. Type, 336 mm. long, from Lord Howe Island.

Plate XLIII.

Fig. 1. *Bleekeria vaga*, n. sp. Type, 166 mm. long, from Lord Howe Island.
,, 2. *Cheilodactylus ephippium*, n. sp. Type, 348 mm. long, from Norfolk Island.

A List of the Fishes of Norfolk Island and Indication of their Range to Lord Howe Island, Kermadec Island, Australia, and New Zealand.

By Edgar R. Waite, F.L.S., Director, South Australian Museum.

[*Contribution from the South Australian Museum.*]

[Read September 14, 1916.]

Plates XLIV. to XLVI.

During a visit paid to Norfolk Island in December, 1915, Mr. A. M. Lea, Entomologist to the South Australian Museum, made a collection of fishes, an examination of which enables me to add materially to the known fauna of the island. Two of his fishes, representing the genera *Archamia* and *Chironemus*, do not appear to have been hitherto described.

In 1910, when in New Zealand, I published a list of the fishes then known from Norfolk Island,[1] but stated that the list was unsatisfactory, inasmuch as specimens received in Sydney some years previously had been only roughly listed, and could not then be again examined. Mr. A. R. McCulloch has since kindly looked over nearly the whole of this material, preserved in the Australian Museum, and has cleared up many of the questions involved; he further adds several species received after my list was published, and the results of his inquiries are embodied herewith.

The following list purports to be complete for Norfolk Island as far as the fishes are at present known, and their range to Lord Howe Island and Australia on the west, and the Kermadecs and New Zealand on the east and south respectively, is likewise indicated; to visualize reference the columns are arranged in geographical sequence, with Norfolk Island in the middle. The presence of a Norfolk Island species in Australia or New Zealand is represented by x in the respective columns: the letters in the three middle columns indicate the initials of the authors who first recorded the species for the island in which column it appears, and the bibliography may be consulted for reference to further details in connection with the records:—

Bl. Bleeker	F. Forster	O. Ogilby
Bg. Boulenger	G. Günther	R. Richardson
CV. Cuvier and Valenciennes	M. McCulloch	W. Waite

(1) Waite: Trans. N. Zeal. Inst., xlii., 1910, p. 370.

Most of Mr. McCulloch's records for Norfolk Island are first published herewith, and the specimens obtained by Mr. Lea at Lord Howe and Norfolk Islands are indicated in their respective columns by an asterisk:—

	Australia	Lord Howe Island	Norfolk Island	Kermadec Island	New Zealand
Mustelus antarcticus, Günther	x		*		x
Chanos chanos, Forskal	x		Bl.		x
Anguilla australis, Richardson	x	O.	* W		x
Gymnothorax nubilus, Richardson		W.	* R.		
,, *thysoideus*, Richardson		* O.	*	W.	
,, *flavimarginatus*, Rüppell		W.	G.		
Muraenichthys nicholsae, Waite		W.	*		
Hyporhamphus intermedius, Cantor	x	* O.	* W.		x
Scombresox forsteri, Cuv. and Val.	x	O.	W.	W.	x
Mugil cephalus, Günther	x	W.	M.		x
Myxus elongatus, Günther	x	* O.	* W.		
Sarda chiliensis, Cuv. and Val.	x		M.		x
Cybium clupeoideum, Broussonet			C.V.		
Caranx georgianus, Cuv. and Val.	x	O.	* R.	W.	x
,, *ferdau*, Forskal	x	M.	M.		
Bathystethus cultratus, Forster		O.	F.		
Kuhlia taeniura, Cuv. and Val.	x	W.	W.		
Schedophilus maculatus, Günther	x	W.	M.	W.	
Amia novae-guinea, Günther			G.		
,, *norfolcensis*, Ogilby		* O.	* O.		
Archamia leai, n. sp.			*		
Epinephelus demaeli, Günther	x	* O.	*Bg	W.	x
,, *merra*, Bloch	x	O	M.		
,, *fasciatus*, Forskal	x	W.	*		
,, *rhyncholepis*, Bleeker		W.	*		
Aulacocephalus temmincki, Günther			M.	W.	
Trachypoma macracanthus, Günther		* O.	* G.	W.	
Acanthistius cinctus, Günther		* O.	* G.	W.	
Pharopteryx nigricans, Rüppell	x	O.	M.		
Arripis trutta, Forster	x	* O.	* F.	W.	x
Labracoglossa nitida, McCull. and Waite		M.	M.		
Oplegnathus, sp., Richardson			R.		
Pagrosomus auratus, Forster	x	O.	G.		x
Lethrinus chrysostomus, Richardson	x		R.		
Kyphosus fuscus, Lacépède		M.	M.		
Girella cyanea, Macleay	x	* O.	* W.	W.	
Monodactylus argenteus, Linnaeus	x		Bl.		
Scorpis violaceus, Hutton	x	O.	* W.	W.	x
Atypichthys latus, McCull. and Waite		M.	*		
Aplodactylus etheridgii, Ogilby		O.	*		
Chironemus microlepis, n. sp.			* M.		
Cheilodactylus ephippium, McCull. and Waite		M.	M.		
Chromis, sp.(2)			W.		

(2) This specimen having been mislaid, its identity cannot now be determined.

	Australia	Lord Howe Island	Norfolk Island	Kermadec Island	New Zealand
Pomacentrus fasciolatus, Ogilby		* O.	*		
Parma polylepis, Günther		* O.	* G.		
Glyphisodon polyacanthus, Ogilby		O.	M.		
,, *sordidus*, Forskal			*		
,, *coelestinus*, Cuv. and Val.	x	O.	*		
,, *glaucus*, Cuv. and Val. ...			*		
Thalassoma lunare, Linnaeus	x	O.	O.		
,, *purpureum*, Forskal		* O.	M.		
,, *aneitense*, Günther	x	W.	G.		
*Halichoeres operc*ularis, Günther	x	W.	* W.		
Coris aygula, Lacépède	x	O.	*		
,, *trimaculata*, Ogilby			* O.		
Anampses elegans, Ogilby		O.	*		
Pseudolabrus inscriptus, Richardson ...		O.	* R.	W.	
,, *luculentus*, Richardson ...	x	O.	* R.	W.	
Scorpaena cooki, Günther		* O.	* G.	G.	
Leptecheneis naucrates, Linnaeus	x		M.		
Limnichthys fasciatus, Waite	x	W.	* W.	W.	x
Gobius aeiosoma, Ogilby		O.	*		
Eviota viridis, Waite	x	W.	*		
Salarias quadricornis, Cuv. and Val. ...		* O.	*		
Petraites roseus, Günther	x	O.	*		
Gillias squamiceps, McCull. and Waite ...		W.	*		
Tripterygion rufopileum, Waite		O.	*		
Dinematichthys longifilis, Ogilby		O.	*		
Peltorhamphus novae-zelandiae, Günther			G.		x
Spheroides altipinnis, Ogilby	x	O.	*		
Balistapus rectangulus, Bloch and Sch.	x		*		
Chilomycterus, sp.(3)			W.		

(3) The example on which this record was based has been destroyed.

Family MUGILIDAE.

Myxus elongatus, Günther.

Pl. xliv.

Myxus elongatus, Günther: Cat. Fish. Brit. Mus., iii., 1861, p. 466.

Cestraeus norfolcensis, Ogilby: Proc. Linn. Soc. N.S. Wales, xxii., 1897, p. 80.

Agonostomus, sp., Waite: Trans. N.Z. Inst., xlii., 1910, p. 381.

The following notes, based upon specimens in the Australian Museum, have been forwarded to me by Mr. McCulloch:—

"An examination of the type of *Cestraeus norfolcensis*, Ogilby, which is preserved in the Australian Museum, shows it to be identical with *Myxus elongatus*. Ogilby described the vomer and palatine bones as smooth, but they each bear

distinct teeth. Since the specimen agrees in all other details with his description, and has a label '*Algonostomus norfolcensis*' tied to it, which is in his own handwriting, there can be no doubt of its authenticity.

"Other smaller specimens in the Australian Museum collection are labelled '*Algonostomus*, sp.,' and are doubtless those upon which the record of this genus from Norfolk Island is founded. They are also *M. elongatus*."

The accompanying plate (xliv.) representing this species is reproduced from my Preliminary Report upon the Fishes of the "Thetis" Trawling Expedition.

Family APOGONICHTHYIDAE.

Archamia leai, n. sp.

Pl. xlv.

B. vi.; D. vii. i. 9; A. ii. 13; P. 11; V. i. 5; C. 17+6; L. lat. 27; L. tr. 2+7.

Length of head 2·76, height of body 2·65, and length of caudal 3·63 in the length. Diameter of eye 2·5, interorbital space 3·84, and length of snout 5·0 in the head.

Head and body compressed, profile of head from snout to the highest point, which is just in advance of the dorsal fin, almost straight, slightly tumid above the eye. The profile from the highest point to the origin of the soft dorsal is slightly concave; it thence falls more rapidly. The ventral profile is more even and convex; interorbital space nearly flat. The snout is rather blunt, the jaws equal; the maxilla reaches to below the middle of the eye, and its distal extremity is pointed above and rounded below, its width being 3·3 in the diameter of the eye: opercles finely serrated. Gills four, a slit behind the fourth; gill-rakers long and thin, twenty-five in number on the first arch, of which twenty are on the lower limb. Pseudobranchiae present. Vent one-third nearer to the anal than to the ventral fins.

Teeth.—Villiform teeth in the jaws, on the vomer and palatines; none on the tongue.

Fins.—The first dorsal originates a little in advance of the opercular margin: the first spine is small and applied to the second, which is shorter than the fourth: the third is the longest, one-half the length of the head: the first ray is one-half longer than the longest spine; the anal has a long base arising in advance and continued posterior to the second dorsal: its second spine is higher than that of this fin: the pectoral is long, extending to the fourteenth scale of the lateral line: the ventral is placed almost wholly in advance of the pectoral, it reaches to between the vent and the anal

fin, and its spine is as long as that of the second dorsal. The caudal is slightly emarginate: its peduncle is long and slender; its length above being twice, and its depth less than the diameter of the eye.

Scales.—The scales are large and finely ctenoid: there are two in advance of the first dorsal. The lateral line closely follows the dorsal profile; it does not run medially along the caudal peduncle, but falls to below the middle, where it is lost at the base of the caudal rays: its scales are branched anteriorly, but become simpler on the tail.

Colour.—The upper half of the head is dark-brown, the lower portion yellow, becoming silvery on the opercles: the two areas are separated by a dark horizontal bar which extends from the snout through the middle of the eye to the margin of the opercle. Below this is a narrow white bar, which broadens slightly on the opercle. The body is pale-brown above and silvery-yellow beneath, with a large brown blotch in the middle of the depth beneath the spinous dorsal, this is split up by three narrow vertical silvery bars: a broad brown band passes from the base of the anterior dorsal rays obliquely forward to the space in front of the anal: the dorsals are dusky, the other fins colourless.

Length.—88 mm. Four specimens obtained.

These specimens differ from typical examples of the genus *Archamia* only in having seven in place of six spines in the first dorsal fin. They apparently approach the characters of *A. zosterophorus*, Bleeker,[4] but in that species the white facial band and the anterior body-blotch are absent, and the complete band includes the whole base of the second dorsal.

Family CHIRONEMIDAE.

Chironemus microlepis, n. sp.

Pl. xlvi.

Chironemus marmoratus, Waite: Trans. N.Z. Inst., xlii., 1910, p. 381 (not of Günther).

Br. vi.; D. xiv. 18; A. iii. 6; P. 9, 6; V. i. 5; C. 15; L. lat. 68.

Depth 3·9 in the length to the hypural joint: head 3·2 in the same. Eye subequal to the interorbital width, shorter than the snout, 4·3 in the head. Snout 3·3, longest pectoral ray 1·2 in the head. Fourth dorsal spine and second dorsal ray 2·3, second anal ray 1·4 in the head.

Snout conical, the upper jaw longer than the lower. Mouth almost horizontal, maxillary reaching to below the

[4] Bleeker: Act. Soc. Nederl., i., Manado, p. 36.

anterior orbital margin. Nostrils large, close together before the eye, the anterior with two fimbriate skinny lobes. Interocular space concave; the orbital margins breaking the contour of the head, and each forming a blunt tubercle posteriorly. Preorbital smooth. Preoperculum broadly rounded, entire. Operculum with two flat spines. Nape rugose, naked.

Teeth.—Broad bands of villiform, depressible teeth on each jaw, and a few forming a curved series around the head of the vomer; palatines toothless.

Scales.—The greater part of the operculum is covered with small scales; similar but smaller scales extend on to the cheeks almost to the end of the maxillary, leaving a broad area on the opercular border and around the eye naked. Body-scales very small on the nuchal region and back, base of pectoral, breast, and abdominal surface. Lateral line running down from the shoulder to the middle of the body below the anterior dorsal rays, thence straight to the base of the tail. There are about eighteen scales between the posterior dorsal spines and the lateral line, excluding the dorsal sheath. Dorsal and anal sheaths well developed.

Fins.—First dorsal commencing above the operculum: the spines increase rapidly in length to the fourth, after which they become gradually shorter backwards; the last two spines are subequal in length. The anterior rays are as long as the highest spines, and the succeeding ones decrease regularly backward, leaving the margin of the fin straight. Anal with three strong spines, the second and third subequal, and the third in close apposition to the first ray, which is thickened and simple; second ray longest, as long as the ventrals. Pectoral pointed, the longest simple ray reaching beyond the middle of the ventrals, which over-reach the vent. Caudal subtruncate.

Colour.—Light purplish-brown in alcohol, checkered with well-defined darker markings which subdivide the ground-colour into subquadrangular patches. Head marbled with the same dark colour, and somewhat speckled with light dots. All the fins are marked with a reticulate, dark pattern, enclosing more or less rounded light spots (McCulloch).

A small example of this species was obtained by Mr. Lea at Norfolk Island, but the foregoing description is based upon a specimen 218 mm. long in the Australian Museum, from which also the accompanying plate is prepared. It differs from *C. marmoratus*, Günther, under which name I have previously recorded it, in having much smaller scales, the cheeks and opercles more densely scaly, and in being rather more elongate.

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EXPLANATION OF PLATES.

PLATE XLIV.

Myxus elongatus, Günther.

PLATE XLV.

Archamia leai, n. sp.

PLATE XLVI.

Chironemus microlepis, n. sp.

Additions to the Flora of South Australia No. 10.

By J. M. Black.

[Read October 12, 1916.]

Plates XLVII. and XLVIII.

The district placed in brackets after the name of a locality means that the record is a new one for that plant in one or more of the botanical districts defined in Tate's "Flora of Extra-tropical South Australia." Some interesting new records were made by Mr. Rodney Cockburn, Secretary of the Railways Standing Committee, while travelling in the Far North-east in June last.

Gramineae.—*Eragrostis leptocarpa*, Benth. Between Goyder Lagoon and the Queensland border (R. Cockburn). This handsome grass, whose panicles become purple with age, has the flowering glume obtuse when spread open (not "rather acute," as described by Bentham) and the palea almost glabrous, with the nerves produced upwards into two acute lateral lobes.

Chenopodiaceae.—I have found it impossible to determine satisfactorily the number of spines in *Bassia paradoxa* (R. Br.), F. v. M., either in the flower or fruit under ordinary conditions. However, by macerating one of the fruiting heads in lime-water all the wool was removed, and it then appeared that the head consisted of eight connate fruits, of which one was 2-spined, one was 3-spined, two were 4-spined, and four were 5-spined. It is clear, therefore, that this species will not fit into the genus *Sclerolaena* (2 dorsal spines), in which it was placed by Brown and retained by Bentham, or into *Anisacantha* (3-5 dorsal spines).

Amarantaceae.—*Alternanthera angustifolia*, R. Br. Between Goyder Lagoon and Queensland border (R. Cockburn); Oodnadatta (Miss Staer). A new record for the State.

Cruciferae.—*Alyssum linifolium*, Steph. Government Farm, Minnipa (Dist. L or W). *Capsella pilosula*, F. v. M. Government Farm, Minnipa (Dist. L or W).

Leguminosae.—*Psoralea eriantha*, Benth. Oodnadatta (Miss Staer); between Goyder Lagoon and Queensland border (R. Cockburn; Dist. C). *Crotalaria Cunninghamii*, R. Br. Mulka (R. Cockburn). This plant, with its showy golden and

dark-striped flowers, is locally known as the "Stuart Pea." *C. dissitiflora*, Benth., var. *eremaea*, F. v. M. Mulka (R. Cockburn; Dist. C). Stipes of pod almost as long as calyx.

ZYGOPHYLLACEAE. — *Zygophyllum fruticulosum*, DC. Specimens from Bell Rock, on the Murray, have smaller flowers and fruit than usual and slender diffuse stems, each capsule containing, by abortion, only one or two seeds.

RUTACEAE.

Phebalium bullatum, *sp. nova.* (tab. xlvii.). *Fruticulus erectus vix metralis, foliis cuneato-linearibus 5-12 mm. longis rigidis crassis margine glanduloso-bullatis supra viridibus acutiuscule canaliculatis subtus argenteo-lepidotis et nervum medium prominentem ostendentibus, umbellis terminalibus, ramulis pedicellis calycibusque lepidotis, calyce obtuse et breviter dentato, petalis intus flavis extus squamulis rufescentibus et albis vestitis, staminibus exsertis, filamentis glabris flavis, antheris caducis glandulâ terminatis, stylo basin versus stellato-piloso, carpellis dense lepidotis.*

South Australia: River Murray (Tate Herbarium, labelled "*Eriostemon lepidotus*, F. v. M., var. *amiefolius*"); Ninety-mile Desert (Tate Herbarium, collector, J. Gudge, labelled "*Eriostemon sediflorus*, F. v. M."); Wilkawatt (T. G. B. Osborn); between Murray Bridge and Callington; Karoonda (J. M. Black).

Victoria (localities kindly supplied by Professor Ewart): Near Lake Hindmarsh (Mrs. Captain Rowan); north-west of Lake Hindmarsh (C. French, sen.); north-west of Lake Albacutya (C. French, sen.).

Flowers September and October. Seems to have been first included by Baron von Mueller under *Eriostemon sediflorus (Phebalium glandulosum*, Hook.), and later under *E. stenophyllus*, F. v. M., which was originally considered by Mueller to be merely a variety of *E. lepidotus*, F. v. M. (*Ph. squamulosum*, Vent.). The varietal name quoted in the Tate Herbarium seems to have been given by Mueller, but not published; I do not understand the word "*amiefolius*"; it is perhaps a transcriber's error for "*crassifolius*." The new species differs from its three East-Australian allies (*Ph. glandulosum*, *squamulosum*, and *stenophyllum*) in the leaves linear-cuneate, more or less acutely channelled above and with a prominent midrib below, never recurved or revolute on the margins, and with very conspicuous glandular tubercles and silvery scales on the margins and underside. The style is stellate-hairy towards the base, while in the other three species it is glabrous.

EUPHORBIACEAE.—*Phyllanthus trachyspermus*, F. v. M. Between Goyder Lagoon and Queensland border (R. Cockburn; Dist. C).

LYTHRACEAE.—*Ammannia multiflora*, Roxb. Between Goyder Lagoon and Queensland border (R. Cockburn). First record for South Australia proper. Given by Tate for Northern Territory (Dist. F).

BORRAGINACEAE. — *Eritrichium australasicum*, DC. Government Farm, Minnipa (Dist. L or W).

SCROPHULARIACEAE.—*Mimulus gracilis*, R. Br. Between Goyder Lagoon and Queensland border (R. Cockburn; Dist. C).

CUCURBITACEAE.—*Cucumis trigonus*, Roxb. Between Goyder Lagoon and Queensland border (R. Cockburn; Dist. C).

COMPOSITAE.—*Gnaphalium indicum*, L. Between Goyder Lagoon and Queensland border (R. Cockburn). First record for South Australia proper. *Brachycome basaltica*, F. v. M. Same locality (Dist. C). *Gnephosis eriocarpa*, Benth. Same locality. Our specimens have all the partial heads 1-flowered, with about six oblanceolate, scarious bracts, united by the wool growing on the green midribs, and with light-yellow (not pink) tips. *Sphaeranthus hirtus*, Willd. Same locality. First record for South Australia. Hitherto found only in Queensland and tropical part of Northern Territory. *Erigeron sessilifolius*, F. v. M. (pl. xlviii.). Pandie Pandie Hills, near the Queensland border (R. Cockburn). Discovered by Alex. Forrest on the Daly River, N.T., and described by Mueller in 1881 (Fragm. xi., 100). It does not appear to have been observed elsewhere since then, and the distance from the Daly River to Pandie Pandie is about 900 miles. The involucral bracts are unusually broad for the genus *Erigeron*, but I cannot see that they are "connate below in a broad lamina," as stated by Mueller. It seems to me that the outer circuit of the very broad, concave receptacle was mistaken for the base of the involucre. Since the above was written, Professor Ewart informs me that the Victorian National Herbarium contains, in addition to the type from the sources of the Daly River, a scrap of the same plant, unnamed but marked "Near Eyre's Creek, 1889; Alfred Henry." Eyre Creek is an affluent of the Warburton and traverses portion of Queensland and South Australia, passing near the Pandie Pandie country.

STYLIDIACEAE.

In the valuable "Census of New South Wales Plants," by Mr. J. H. Maiden and the late Mr. E. Betche, the authors

follow Mueller in substituting *Candollea*, Labill., for *Stylidium*, Swartz, and say (p. 162):—"The genus *Candollea* was founded by Labillardière in 1805; one year later the same author applied the name *Candollea*, apparently by an oversight, to another genus *(Dilleniaceae)*. As both genera could not stand, Swartz changed *Candollea (Candolleaceae)* in 1807 into *Stylidium*, and consequently the order into *Stylidieae*, but in doing so he made the twofold mistake of changing the name of the plant that has undoubtedly the claims of priority and of selecting a name *(Stylidium)* already applied by Loureiro in 1790 to a genus of *Cornaceae*. There can be no doubt that F. v. Mueller was right in restoring the name *Candollea* to the genus first named so by Labillardière *(Candolleaceae)*. Labillardière's second genus, *Candollea (Dilleniaceae)*, of course, had to go, and is now united with *Hibbertia*."

The whole question is of great importance to Australian systematic botany, and therefore the following comments will not be out of place:—

1. Labillardière did not apply the name *Candollea* in 1806 to a genus in *Dilleniaceae* "by an oversight," but because he found that the genus in *Stylidiaceae* which he had named *Candollea* in 1805 had, earlier in the same year, been published as *Stylidium* by Swartz in Willdenow's Spec. Pl. iv., 146. This was the first description of that genus, the second being in 1807. The *Stylidium* of Swartz has, therefore, a clear priority over the first *Candollea* of Labillardière.

2. Thus the only question to determine is whether the *Stylidium* of Loureiro, published in 1790, is a valid genus in *Cornaceae* and therefore invalidates the *Stylidium* of Swartz. To this the reply is that the *Stylidium* of Loureiro is considered by all the great botanical authorities (Bentham and Hook., Gen. Pl.; Index Kewensis; Engl. and Prantl, Nat. Pflanzenfam.) as a synonym of *Marlea*, or of *Alangium* if *Marlea* be considered a section of that genus. It is not even certain whether it can be identified with *Marlea*. H. Harms, in the Nat. Pflanzenfam., iii., 8, 260, says:—"*Stylidium chinense*, Loureiro, Fl. Cochinch. ed. Willdenow (1793), p. 273, is generally quoted as a synonym of *Marlea begoniifolia*, Roxb.: but as Loureiro speaks of a '*corolla infera*' and '*drupa supera*,' the description he gives does not agree with *Marlea begoniifolia*. In any case, it now seems to me questionable whether Loureiro's diagnosis can be referred to *Marlea*."

3. Mueller, after he had attempted to restore Labillardière's first *Candollea* and Loureiro's *Stylidium*, renamed the Australian plant, *Marlea vitiensis*, Benth., as *Stylidium vitiense*, F. v. M., but in the "Census of New South Wales

Plants'' Bentham's name is retained and Mueller's treated merely as a synonym.

4. As the *Stylidium* of Loureiro has fallen into complete disuse and become only a synonym, the way is cleared for the adoption of Swartz's *Stylidium*. Article 50 of the Vienna rules says:—"No one is authorized to reject, change, or modify a name . . . because of the existence of an earlier homonym which is universally regarded as non-valid." This was evidently the view taken by Bentham in the "Flora Australiensis," and more recently by Dalle Torre and Harms in their "Genera Siphonogamarum," and by Mildbraed in "Engler's Pflanzenreich, Stylidiaceae."

DESCRIPTION OF PLATES.

Plate XLVII.

Phebalium bullatum, n. sp. 1 and 3, upper-surface of leaves; 2 and 4, under-surface of leaves; 5, transverse section of leaf; 6, scale from under-surface of leaf; 7, pistil; 8, petal; 9, stamen.

Plate XLVIII.

Erigeron sessilifolius, F. v. M. 1, half of receptacle and involucre, spread out and seen from below; 2, bisexual flower; 3, female flower; 4, style-branches; 5, stamens; 6, hairs.

A Research on the Eucalypts of South Australia and their Essential Oils.

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(Communicated by Prof. E. H. Rennie, M.A., D.Sc., Lond.)

[Read October 12, 1916.]

Plates XLIX. to LII.

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1.—ACKNOWLEDGMENTS.

We have to acknowledge our indebtedness to Mr. Walter Gill, F.L.S., the Conservator of Forests of South Australia, for kindly furnishing material for distillation of several of the species, and to Mr. E. Burgess, of Kangaroo Island, who at considerable personal effort forwarded material for distillation of the Kangaroo Island species.

We have also to tender our thanks to the Education Department of South Australia for kindly granting permission to circularize the teachers under its jurisdiction, asking them to aid in the preparation of this paper. We received material and general information from this source, and wish to express our thanks to those correspondents whose individual names are given at the end of this paper. The list of localities from which the material was collected is also given.

2.—INTRODUCTION.

(a) Botanical.

The systematic side of the South Australian Eucalypts has received a fair amount of attention at the hands of botanists, and the "Census" of Professor Tate in Transactions of the Royal Society of South Australia, 1889, p. 93, leaves little to be desired up to that date. No special work, however, has been published on the economics of these Eucalypts, especially as regards the chemistry of their essential oils, and it is these desiderata that form the main object of this paper.

The species are arranged according to the plan laid down in our work, "A Research on the Eucalypts and their Essential Oils," Sydney, 1902. It may be stated that those species occurring in the Northern Territory are not included in this list.

A few alterations from Tate's list are as follows:—*E. albens*, *E. calycogona*, *E. elaeophora*, *E. Bosistoana*, *E. Lansdowniana*, and *E. acervula* are added, whilst *E. amygdalina*, *E. paniculata*, *E. goniocalyx*, *E. Stuartiana*, *E. Gunnii*, *E. Sieberiana* are omitted, as there is not sufficient evidence forthcoming of their occurrence in South Australia.

The number of Eucalypts recorded for South Australia falls much short of those for the other States, except perhaps Tasmania, a fact probably due to its geographical position in regard to the main mountain ranges of the continent, where the species are found to be more numerous. The species show perhaps a closer botanical connection with those of Victoria and Tasmania than of other contiguous States, while the greatest differences exist between them and those of New South Wales and Western Australia. What may be regarded as the introductory group of the genus Eucalyptus—the "Bloodwoods"—is practically unrepresented, and this fact again illustrates the argument which was advanced by us in a paper on the Victorian Eucalypts (Reports, A.A.A.S., vol. xiv., p. 296-7) concerning the period of development of the Eucalypts in Australia. Although the most numerous group of the South Australian Eucalypts is the "Mallee," even this numbers less than a dozen species, probably due to the greater uniformity of the topographical features from those of the neighbouring States.

The next largest group is the "Gums," and here we have a very interesting specimen, *E. acervula*, which was originally described from Tasmania, and is now shown for the first time to also occur on the mainland. On morphological grounds it has previously, in South Australia, gone under the name of

E. Gunnii, but xylogically and chemically the relationship cannot be established with that Tasmanian species.

The salient species of this group is the "Murray Red Gum," *E. rostrata*, a characteristic feature on all the waterways in the State.

The group known as "Boxes," so prominent in New South Wales, is also not wanting in South Australia, and *E. Woollsiana* and *E. albens* are good representatives.

The "Stringybark" group has likewise a good representative in *E. obliqua*, which is restricted to the South-eastern ranges, where it is found growing along with the other "Stringybarks," *E. capitellata* and *E. macrorhyncha*.

Such distinctive groups as "Peppermint" and "Ironbark" are quite absent—not a single species of either being so far recorded.

Of these groups, the best timber trees are *E. rostrata*, *E. obliqua*, *E. leucoxylon*, *E. microtheca*, and *E. largiflorens;* while the best oil-producing species are *E. cneorifolia*, *E. odorata*, and *E. oleosa*.

It thus appears that these are the best of the South Australian species of Eucalypts for re-afforestation, or for commercial oil-production.

The following list gives the approximate number of representatives of the several groups:—Stringybarks, 3; Gums, 9; Mallees, 11; Boxes, 8; Ironbarks, 0; Bloodwoods, 0; Peppermints, 0; Ashes, 0.

(b) Chemical.

The chemical investigation of the Essential oils of a number of species which are considered in this paper for the first time shows that, taken as a whole, general agreement may be traced between the constituents of these species and those of certain groups growing in the eastern portion of the continent. None of them, however, is referable to the large group of phellandrene-bearing oils which occurs so plentifully in the highlands of New South Wales and Victoria, and in Tasmania. The characteristic constituent of the oils of these latter species is the ketone piperitone, and in no case was this constituent detected in the oils of the ten species now investigated for South Australia. The distinguishing constituent most frequently occurring in these oils is aromadendral—the high-boiling laevorotatory aldehyde so frequently found in the oils of the "Mallees" and in those species allied to them, as, for instance, the typical "Boxes" (*E. hemiphloia*, *E. albens*, etc.).

The quantity of oil obtained from the leaves of some of the species described is particularly small, and in no instance

was a yield of 2 per cent. of oil obtained. The oils of two species from Kangaroo Island (*E. cneorifolia* and *E. odorata*) are almost identical in composition with that yielded by *E. polybractea*, the "Silver-leaf Mallee" of Victoria, and the "Blue Mallee" of New South Wales; and the oils of these three species may be considered as being amongst the richest in cineol content of all the oils yielded by the genus Eucalyptus. Most of the rectified oils of the species now described for the first time were tinged yellow, and none was water-white similar to those of the "Peppermints" and of the "Ashes." This colour is traceable to the influence of the particular phenol occurring in this group, which evidently forms a quinone structure at certain stages. It does not appear to contain a methoxy group in the para position similar to Tasmanol—the phenol of the "Peppermint group"—and is crystallizable.

The oils of all the species contain esters, as do all crude Eucalyptus oils, although in some cases very small in amount. The esters in the oil of *E. fasciculosa* represented 7·7 per cent., if the alcohol had the $C_{10}H_{17}OH$ molecule, and the acid acetic. The alcohol did not appear to be geraniol; but the amount of oil at our disposal was altogether too small for it to be isolated and determined. The ester, geranyl-acetate, was present to the extent of about 14 per cent. in the oil of *E. acervula*. Pinene was a constant constituent in practically all the oils, although in some of them the amount was but small. Limonene was also detected in the oils of a few species, as also was phellandrene. Cymene was determined as occurring in the oil of *E. rostrata* in some quantity, and a good deal of work was done on the aromadendral, which also occurs in this oil in fair amount. The oil from *E. rostrata* from Kangaroo Island was of particular interest, and analysis shows it to be in close agreement with those we distilled from material collected many years ago at Albury, and at Hay, in New South Wales. The results were published in 1902 in our work, "A Research on the Eucalypts."[2] The oil distilled from the variety *borealis* of this species, while being as comparatively constant in itself as that of the type, has differences in constitution particularly marked, the two forms being in this respect quite distinct. We have now investigated material from both forms collected from several localities widely separated, and quite recently oil distilled in Victoria from the variety *borealis* has been analysed.

It will be observed that only a few South Australian specimens now remain of which the oils have not been investigated, and we should be glad to receive material of these for distillation and investigation.

3.—GENERAL GROUPING OF SOUTH AUSTRALIAN EUCALYPTS.

STRINGYBARKS:—
E. obliqua
E. capitellata
E. macrorhyncha

MALLEES:—
E. Behriana
E. gracilis
E. odorata
E. oleosa
E. uncinata
E. cneorifolia
E. dumosa
E. calycogona
E. incrassata
E. pachyphylla
E. Lansdowneana

BOXES:—
E. olaeophora
E. Bosistoana
E. albens
E. Woollsiana
E. hemiphloia
E. largiflorens
E. microtheca
E. santalifolia
E. Blackburniana

GUMS:—
E. acervula
E. viminalis
E. rostrata
E. cosmophylla
E. fasciculosa
E. leucoxylon
E. coriacea
E. corynocalyx

4.—SPECIES, WITH THEIR SYSTEMATIC, TECHNOLOGICAL, AND CHEMICAL DATA.

(Arranged in order of sequence.)

1. EUCALYPTUS CAPITELLATA, Sm. (Bot. New Holl., 42, Trans. Linn. Soc., iii., 285).

"Stringybark."

This species is one of the best known of the "Stringybarks" in the three States—South Australia, Victoria, and New South Wales; in the latter it is called "Brown Stringybark." In South Australia it attains the greatest height of all the "Stringybarks," and is one of the most valuable timber-trees in the State.

Brown, in his "Forest Flora of South Australia," figures and gives a full account of the features and economics of the species.

Its botanical and chemical characters are fully described in our "Eucalypts and Essential Oils," p. 149.

2. EUCALYPTUS MACRORHYNCHA, F. v. M.

"Red Stringybark."

Tate, in his "Census" (Trans. Roy. Soc. S. Aus., vol. xii., 1889, p. 94) records this species for South Australia,

but Maiden (Trans. Roy. Soc. S. Aus., vol. xxxii., p. 285) states that a specimen in the University Herbarium of Adelaide, labelled by Tate "*E. macrorhyncha* . . . . . is *E. obliqua*, L'Her. If *E. macrorhyncha* has been admitted to the Flora of South Australia on the authority of that specimen, it should be removed." We, however, have received a specimen from Mount Templeton (C. N. Grenfell) which is undoubtedly *E. macrorhyncha*.

Its botanical and chemical characters are given in our work, "Eucalypts and Essential Oils," p. 146.

3. Eucalyptus santalifolia, F. v. M.
"White Mallee."

This species was described by Baron von Mueller in Trans. Vict. Inst., 1854. Bentham, in his "Flora Australiensis," vol. iii., 1866, recognized its validity as a species, and Mueller in his "Eucalyptographia," 1879, gives a figure. J. H. Maiden, in his "Critical Revision of the Eucalypts," suppresses it as a synonym under *E. diversifolia*, Bonpland, which Bentham regarded as a variety of *E. viminalis* ("Flora Australiensis," iii., p. 240). It is apparent from this that the systematic placing of this tree is now surrounded with difficulty.

Mueller, in his "Eucalyptographia," under his *E. santalifolia*, synonymizes Bonpland's *E. diversifolia*, remarking that "as the plant defined by Bonpland represents that very young state . . . in which the leaves pass from the broad form of juvenile plants into the narrow shape of the leaves, . . . normal for adult trees, the name had to be discarded." The figure illustrating Bonpland's plant, which Mueller states was done by Massa, we have not seen.

As Bentham places Bonpland's *E. diversifolia* under *E. viminalis*, the inference is that there must have been some resemblance to that species, and then, in spite of this, we have Mueller bringing it under his *E. santalifolia*. Bentham fully describes *E. santalifolia* F. v. M. (vol. iii., p. 206), and does not allude to its resemblance to *E. diversifolia*, and he probably saw specimens of both.

Bentham, when mentioning this species (*E. santalifolia*) under *E. viminalis*, states that "the flowers are rather numerous in the umbel and the fruit large." Now six flowers are the most we have seen in *E. santalifolia*; Mueller's figure shows only three at the most. The leaves, at least, and certainly not the fruits, can hardly be said to resemble those of *E. viminalis*, so that it appears Bentham must have had material differing from *E. santalifolia*, as now understood, when he matched *E. diversifolia* with *E. viminalis*.

The late Rev. Dr. Wools named specimens of what is now *E. rubida* for one of us as *E. diversifolia*—a very good name for the tree—specimens of which Bentham may have had when identifying *E. diversifolia* of Bonpland. Unfortunately, no one seems to have described the "sucker" or abnormal leaves of *E. santalifolia*, or, for the matter of that, *E. diversifolia*, so that it is difficult to understand how the latter name applies to Mueller's tree, as the leaves are not diverse.

Maiden, in his "Critical Revision of the Eucalypts," Part iii., reproduces in full Bonpland's description of *E. diversifolia*, but unaccompanied by Massa's plate.

The more experience we have with Eucalypts the more the fact is impressed upon us that it is more often than not almost impossible to identify Eucalyptus trees or material from descriptions alone, and this is the difficulty with Bonpland's description. In this connection it brings to mind the words of Caley in "Flinders' Voyages," vol. ii., p. 547, under "Eucalyptus":—"Fifty species of Eucalyptus, most of which are distinguished and have proper names applied to them by the native inhabitants, who, from differences in colour, texture, and scaling of the bark, and in the ramification and general appearance of these trees, more readily distinguish them than botanists have as yet been able to do."

Of the identity of *E. santalifolia*, as now established, there can be no doubt, and as the chemical data are made on that species there is no other alternative but to retain that name for the result of this investigation.

Essential Oil.

Leaves and terminal branchlets of this species for distillation were collected at the Kingscote end of Kangaroo Island in the month of June.

The average yield of oil was 0·41 per cent. The crude oil was of a lemon-yellow colour and had a terpene-like odour, which almost entirely masked that of the small amount of cineol. Although chiefly a terpene oil, and highly laevorotatory, yet phellandrene was absent. The oil also contained nearly 20 per cent. of sesquiterpenes. The crude oil had specific gravity at 15° C. = 0·884; rotation $^{a}D - 37·7°$; refractive index at 20° = 1·4736, and required 8 volumes 80 per cent. alcohol to form a clear solution.

The saponification number for the esters and free acids was 4·9.

On rectification a few drops of acid water came over, but the volatile aldehydes were present only in very small amount. Between 168-175° (corr.), 38 per cent. distilled;

between 175-200°, 39 per cent. came over; and between 260-275°, 17 per cent. distilled.

These fractions gave the following results:—

	Sp. gr. at 15° C.	Rotation a_D.	Ref. index at 20°.
First fraction	0·8674	−38·6°	1·4670
Second fraction	0·8701	−52·2°	1·4691
Third fraction	0·9295	—	1·4963

The cineol was determined by the resorcinol method in the portion distilling below 200°, and the result gave 12·5 per cent. of that constituent for the crude oil.

The oil is thus shown to consist largely of terpenes, so that redistillation of the two first fractions was undertaken. Three per cent. of the first fraction was removed, which boiled below 162°. The second fraction was then added and the whole fractionated, in order to further separate the lower-boiling terpenes. Between 162-172°, 34 per cent. distilled (=second fraction); between 172-175°, 16 per cent. distilled. These fractions gave the following results:—

	Sp. gr. at 15° C.	Rotation a_D.	Ref. index at 20°.
First fraction	0·8597	−29·6°	1·4673
Second fraction	0·8574	−48·0°	1·4693
Third fraction	0·8574	−65·6°	1·4711

These results suggest that as phellandrene is absent the principal terpene in the oil of this species is laevorotatory limonene, and that pinene is only present in small quantity. For industrial purposes the essential oil of this Eucalypt has little commercial value at present.

4. Eucalyptus Bosistoana, F. v. M.

(Australasian Journal of Pharmacy, October, 1895.)

"Red Box."

This species probably occurs in South Australia, as material received by us from Mount Templeton (C. N. Grenfell) and Seven Hills (Clara A. Chesterman) resembles this Eucalyptus more than any other. The material, however, was hardly perfect enough to speak definitely.

Its botanical and chemical characters are given in our work, "Eucalypts and Essential Oils," p. 61.

5. Eucalyptus gracilis, F. v. M.

A "Mallee."

This species was described by Mueller in 1884 in Trans. Vict. Inst., i., 35, and Frag. ii., 55. Bentham, in his "Flora Australiensis," acknowledges the specific rank of this Eucalyptus, as well as Tate in his "Census of South Australian Plants," 1889. Maiden (Crit. Rev. Gen. Euc., vol. i., p. 81) synonymizes this species under *E. calycogona*, Turcz. The material of *E. calycogona* has not been investigated by us, so that we cannot speak as to the synonymy of these species. The material examined is *E. gracilis*, F. v. M.

The botanical and chemical characters are given in our work, "Eucalypts and Essential Oils," p. 129.

6. Eucalyptus odorata, Behr. (Sch. Linnea., xx., 657).

"Peppermint."

Pl. l.

Behr's species is acknowledged in Bentham's "Flora Australiensis" and Mueller's "Eucalyptographia," and later by Maiden in his "Critical Revision of the Eucalypts," vol. ii., part i., p. 26, as well as in the Trans. Roy. Soc. S. Aus., 1903, where he goes fully into the synonymy of the species.

With most of this latter synonymy we are not in accord, especially placing *E. Lansdowniana* under *E. odorata*. Brown, in his "Forest Flora of South Australia," figures both species, and if any reliance can be placed in delineation greater differences could not be better illustrated. Brown's figure is what we regard as *E. Woollsiana*.

The species, as understood in this paper, is restricted to the tree commonly known as "Peppermint," found in the neighbourhood of Adelaide and elsewhere in the State, including Kangaroo Island. To assist in its identification a figure is here given (pl. l.).

The results given in our work, "Eucalypts and Essential Oils," p. 210, were obtained from an oil submitted by Faulding & Co., of Adelaide, under that name, and was not of our distillation.

Essential Oil.

Leaves and terminal branchlets of this species for distillation were collected at the Kingscote end of Kangaroo Island in the month of June.

This species is considered by Eucalyptus distillers of Kangaroo Island to be of equal value with *E. cneorifolia* for oil distillation.

The origin of the name "Peppermint" for this species could not be traced, and it seems to be altogether a misnomer, as the ketone of peppermint odour (piperitone) appears to be absent in the oil, the characterstic high-boiling constituent being aromadendral. The name "Peppermint" is also given to Eucalyptus species in New South Wales, the oils of which do not contain piperitone, nor do their oils have a peppermint odour. The oils of the true "Peppermint" Eucalyptus species contain the terpene phellandrene, in addition to the peppermint ketone.

The average yield of oil was 1·87 per cent., but as the material was collected in the winter this may be taken as the minimum yield. The crude oil was orange-brown in tint, indicating but a trace of phenol, and had an odour similar to those belonging to the cineol-pinene group, with a secondary odour indicating aromadendral. Volatile aldehydes were pronounced. The oil was very rich in cineol, and phellandrene was absent.

The crude oil had specific gravity at 15° C. = 0·9193; rotation $^{a}D - 1·1°$; refractive index at 20° = 1·4639, and was soluble in $1\frac{1}{4}$ volumes 70 per cent. alcohol. The laevorotation shown by this oil is due to the aromadendral. The saponification number for the esters and free acids was 8·5.

On rectification a few drops of acid water with some aldehydes came over below 173° C. (corr.), showing the comparative absence of the lower-boiling terpenes. Between 173-185°, 82 per cent. distilled; between 185-215°, 8 per cent. came over, and between 215-230°, 4 per cent. distilled. These fractions gave the following results:—

	Sp. gr. at 15° C.	Rotation a_D.	Ref. index at 20°.
First fraction	0·9153	− 0·1°	1·4619
Second fraction	0·9161	− 0·7°	1·4639
Third fraction	0·9219	−11·7°	1·4794

The high laevorotation of the third fraction is due to the aromadendral. The cineol was determined by the resorcinol method in the fractions distilling below 185°. The results from two determinations showed that 86 per cent. of cineol was present in the crude oil, which proves it to be one of the richest cineol-bearing oils of the whole group.

The rectified oil was slightly yellow in tint, due to the particular phenol present.

There is a very strong resemblance between the oil of this Eucalypt and that of "Narrow Leaf," *E. cneorifolia*, and for commercial purposes no marked differences should be detected between the products of the two species.

7. Eucalyptus oleosa, F. v. M. (Neder Kruid. Arch., iv., 132).

"Red" or "Water Mallee."

Pl. lii.

This Eucalyptus species, one of the large group known as "Mallees," preserves its specific botanical and chemical characters throughout its geographical distribution. It is fully described, both systematically and chemically, in our work on the "Eucalypts and their Essential Oils," p. 118.

8. Eucalyptus uncinata, Turcz.

A "Mallee."

In this State it occurs on Kangaroo Island, as well as the mainland, and is fairly constant in its characters, being always found as a "Mallee."

This is a species that so far has eluded us, and we have not yet been able to procure material for chemical investigation.

9. Eucalyptus cneorifolia, DC. (Prod., iii. p. 220).

"Narrow-leaf Mallee."

Pl. xlix.

The specific rank of this Eucalypt has so far been unchallenged. It is the "Narrow-leaf Mallee" of Kangaroo Island, although it is not uncommon to find it in small tree form. A figure is given of it in DC. Mem. Myrt., t.p., according to Bentham *(loc. cit.)*, but so far it has not been depicted in any Australian publication. A figure is, therefore, given with these results, which will more definitely place it for future reference for botanical workers, both in and outside Australia (pl. xlix.).

Essential Oil.

Leaves and terminal branchlets of this species for distillation were collected at the Kingscote end of Kangaroo Island in the month of June. This species is the principal one on the island from which Eucalyptus oil for pharmaceutical purposes is distilled. It is one of the "Mallees," or shrubby Eucalypts, and is a very common species on Kangaroo Island.

The species known as "Peppermint" on the island seems to be closely related chemically to *E. cneorifolia*, and the oils distilled from these two trees show great resemblances. The principal constituent is cineol, and pinene is only present in comparative small amount. The high-boiling aldehyde, aromadendral, is a characteristic constituent in this oil, even more so than in that of the "Peppermint." The rectified oil is slightly yellow in tint, as is usual with the oils of this group. This colour is due to the influence of the particular phenol present. The product of this species is one of the most pronounced cineol-bearing oils obtainable from the whole genus, but requires rectification, so that the aromadendral may be removed as much as possible.

The average yield of oil was 1·8 per cent., but this may be taken as the minimum yield, as the material was collected in mid-winter. The crude oil was orange-brown in tint, and had an odour similar to the cineol-pinene oils of this group, with a secondary odour of aromadendral. Volatile aldehydes were present, but phellandrene was absent.

The crude oil had specific gravity at 15° C. = 0·9229; rotation, $a_D - 3·3°$; refractive index at 20° = 1·4664, and was soluble in $1\frac{1}{4}$ volumes 70 per cent. alcohol. The laevorotation of this oil is largely due to the aromadendral. On rectification a few drops of acid water with some aldehydes came over below 174° (corr.). Between 174-185° C., 81 per cent. distilled; between 185-220°, 9 per cent. came over; and between 220-237°, 5 per cent. distilled. These fractions gave the following results:—

	Sp. gr. at 15° C.	Rotation a_D.	Ref. index at 20°
First fraction	0·9166	− 1·1°	1·4632
Second fraction	0·9172	− 4·1°	1·4678
Third fraction	0·9291	−16·2°	1·4866

The high laevorotation of the third fraction is due to the aromadendral. The cineol was determined by the resorcinol method in the fractionated oil. When calculated for the crude oil the result showed that 87 per cent. of cineol was present. The saponification number for the esters and free acids was 7·4.

It will be noticed how closely the above results agree with those obtained with the oil distilled from the species known vernacularly on Kangaroo Island as "Peppermint" (*E. odorata*).

10. Eucalyptus dumosa, A. Cunn. (Schau. in Walp. Rep., ii., p. 925, 1843).

"Red Mallee."

We are in favour of keeping this species distinct from *E. incrassata* at present, in opposition to Mueller ("Eucalyptographaia," Dec. V.), where it is synonymized under that species, while Maiden ("Crit. Rev. Gen. Euc.," vol. i., p. 95) only gives it varietal rank to *E. incrassata*. The specimens received by us from various parts of South Australia are morphologically identical with many others received from New South Wales and Victoria, thus showing a uniformity over a large geographical area of the mainland, which, we think, warrants its specification.

It is botanically and chemically described in our work on "Eucalypts and Essential Oils," p. 117.

The material for botanical investigation for this paper was obtained from Kangaroo Island, and the fruits differ only slightly from those of the mainland, being inclined to pear shape and a little longer than the mainland *E. dumosa*.

The chemical results show a little variation, but not anything nearly sufficient to warrant the making of even a new variety.

Essential Oil.

Leaves and terminal branchlets of this species for distillation were collected at the Kingscote end of Kangaroo Island in the month of June. The leaves of this species were somewhat thick, and the terminal branchlets had quite angular stems, the bark on the branchlets being quite red in places. The leaves, after steam distillation, had become quite red in colour, particularly the young shoots at the end of the branchlets. This peculiar red colour, given to the steam-distilled leaves, was also observed with those of *E. leucoxylon*, but not with the leaves of the "White Mallee" or of any other species from Kangaroo Island.

The average yield of oil was 0·96 per cent. The crude oil was reddish in colour and in odour resembled the oils of the pinene-cineol group. Cineol was present in fair quantity, but phellandrene was absent. The terpene of low-boiling point was dextrorotatory pinene, and the high-boiling fraction consisted principally of the sesquiterpene.

The crude oil had specific gravity at 15° = 0·9041; rotation $\alpha_D + 16·4$; refractive index at 20° = 1·4667, and required one volume of 80 per cent. alcohol to form a clear solution. The saponification number for the esters and free acids was 3·7.

On rectification a few drops of acid water with some aldehydes came over below 163° C. (corr.). Between 163-167°, 32 per cent. distilled; between 167-198°, 53 per cent. came over; the temperature then rose to 245°, and between that temperature and 272° 10 per cent. distilled. These fractions gave the following results:—

	Sp. gr. at 15° C.	Rotation a_D.	Ref. index at 20°.
First fraction	0·8854	+24·5°	1·4629
Second fraction	0·9022	+14·1°	1·4625
Third fraction	0·9289	—	1·4920

The cineol was determined by the resorcinol method in the portion distilling below 198°. When calculated for the crude oil the result showed 42·5 per cent. of cineol to be present.

The oil belongs to the pinene-cineol class, and does not contain constituents which might be considered of a special character. The species is thus of little value as an oil-producing tree, particularly as others are available from which a greater yield of oil can be obtained and also much richer in cineol.

The chemical resemblance between "Blue Gum" *(E. leucoxylon)* and "Red Mallee," as shown by the formation of a red coloration to the leaves when steam-distilled, is further exemplified with their oils, and it will be observed that the results obtained with the oils of these two trees are in strong agreement.

11. Eucalyptus pachyphylla, F. v. M. (Jour. Linn. Soc., pp. 111, 98).

This species belongs to the shrubby group of Eucalypts, and is found in the dry interior near Lake Amedeus, and the McDonald Range.

12. Eucalyptus Lansdowneana, F. v. M. et J. E. B. ("Forest Flora of S. Aus.").

"Red Flowering Mallee."

This was described and figured by Mueller and Brown in "The Forest Flora of South Australia," published in 1882.

It was described from the Gawler Ranges specimens, but the authors give Encounter Bay, Ch. Stuart, 1847, and Port Lincoln, 1851.

Tate (Proc. A.A.A.S., Sydney, 1898, p. 535) states it is not a tenable species, and Maiden ("Crit. Rev. Genus Euc.," vol. ii., p. 32) places it as a variety of *E. odorata*.

The fruits figured *(loc. cit.)* do not match those of any other South Australian species seen by us (including a large series of *E. odorata)*, and therefore we are inclined to regard it as a valid species, after seeing the specimen in the Adelaide University Herbarium.

13. Eucalyptus Blackburniana, Maiden, ined.

The Melbourne Herbarium specimen of this species is labelled by Mueller "*E. odorata*, Behr., Yorke Peninsula, Teffer, 1879." Similar material has reached us from Murray River, Staer, 1911, and also from the Sydney Herbarium, the latter labelled *E. Blackburniana* by Mr. Maiden.

If this should prove to be distinct from *E. odorata*, then Mr. Maiden's name should stand.

14. Eucalyptus Behriana, F. v. M. (Trans. Vict. Inst., i., 34).

"Bull Mallee."

This species of Mueller is found in Victoria and New South Wales, and preserves a morphological constancy throughout its geographical distribution.

The botany and chemistry is described in our work, "Eucalypts and their Essential Oils," p. 69.

15. Eucalyptus calycogona, Turcz.

Pl. li.

There is a specimen of this species in the Adelaide University Herbarium from Wirrabara, and specimens were also received from Walter Gill, F.L.S., so this should be added to the South Australian flora.

16. Eucalyptus incrassata, Labill. (Pl. New Holland, vol. ii.).

A "Mallee."

It was originally recorded by the French author from Cape Leeuwin, but since then has been found to extend very

far east from that point, even into the most Eastern State, New South Wales. The fruits are variable in size and shape, but unfortunately Labillardière does not figure the fruits, so that a certain amount of conjecture surrounds the form published.

The large coarse-ribbed fruit and the two smooth capsules are delineated by Mueller in his "Eucalyptographia" (the three left figures are all found in South Australia).

Maiden, in his "Crit. Rev. Gen. Euc.," vol. i., under this species describes a large number of varieties, with fruits varying from 1 in. long and $\frac{1}{2}$ in. diameter to a small pilular specimen about $\frac{1}{4}$ in. long and $\frac{1}{8}$ in. diameter, including *E. dumosa*, which we, however, regard as a separate species.

17. Eucalyptus Woollsiana, R. T. B.

There appears to have been some confusion in the past between this species and its congeners, for that figured by J. E. Brown, "Forest Flora of South Australia," under *E. odorata* is this species. Specimens were received which match the type collected in New South Wales.

It is botanically and chemically described in our work, "Eucalypts and their Essential Oils," p. 132.

18. Eucalyptus albens, Miq.

"White Box."

There is a specimen in the National Herbarium, Melbourne, collected by J. E. Brown, with locality Wirrabara, South Australia, so that if this specimen is authentic this species should be added to the South Australian flora.

The chemistry of this species will be found in our work, "Eucalypts and their Essential Oils," p. 134.

19. Eucalyptus hemiphloia, F. v. M. (Frag., ii., p. 62).

"Box."

Bentham, in his "Flora Australiensis," vol. iii., p. 216, records this species for South Australia, and Tate, in his "Census," lists it; but Maiden, in his "Crit. Rev. Gen. Euc.," vol. ii., p. 15, is inclined to think that an error is recorded here, and that it is *E. odorata*, var. *purpurascens*, that is indicated.

From the material received by us from South Australia only two specimens showed resemblance to this species; the specimens, however, were not in mature fruit.

No specimen appears to be extant in Adelaide Herbarium of this species, but in the Melbourne Herbarium there is a specimen of it, labelled "W. Gill, from Mount Remarkable."

It is botanically and chemically described in our work on "Eucalypts and their Essential Oils," p. 135.

20. Eucalyptus largiflorens, F. v. M. (Trans. Vict. Inst., i., 134).

A "Red Box."

Professor Tate records this species for South Australia in his "Census," but Mr. Maiden, in his paper, "A Contribution to the Botany of South Australian Flora" (Trans. Roy. Soc. S. Aus., vol. xxxii., p. 280), places this species under *E. fasciculosa*, F. v. M. Both these species are Mueller's, and the specimens examined by us in the Tate Collection, Adelaide University, is Mueller's *E. largiflorens*.

It is botanically and chemically described in our work on "Eucalypts and their Essential Oils," under *E. pendula*, p. 71.

21. Eucalyptus microtheca, F. v. M. (Jour. Linn. Soc., iii., 87).

"Coolabah."

This interior species of the State, as well as in New South Wales, is easily distinguished from its congeners by its small fruits and the comparatively large exserted valves. It is probably the tallest tree of those parts. The timber is very hard, interlocked, and durable, and is of a pale chocolate colour.

It is botanically and chemically described in our work, "Eucalypts and their Essential Oils," p. 158.

22. Eucalyptus elaeophora, F. v. M. (Frag. ii., p. 52).

"Bundy."

This species is recorded for South Australia by Tate in his "Census," under the name of *E. goniocalyx*, F. v. M., with which species it was first placed by Bentham in his "Flora Australiensis," vol. iii., p. 230, and acquiesced in by Mueller in his "Eucalyptographia." The two, however, are quite distinct, as recognized by all later botanists.

It is botanically and chemically described in our work, "Eucalypts and their Essential Oils," under the name of *E. Cambagei*, p. 113.

23. Eucalyptus acervula, Hook. f. (Fl. Tas.).

This species of Hooker was fully investigated by us when writing our paper on "The Eucalypts of Tasmania" (Proc. Roy. Soc. Tas., October, 1912), where it is also shown in what respects it differs from *E. paludosa* of New South Wales. It is the species recorded by botanists of South Australia as *E. Gunnii*, and is figured as such by J. E. Brown in his "Forest Flora of South Australia." *E. Gunnii*, the "Cider tree" of Tasmania is, however, quite another species, the botanical and chemical differences being already given by us *(loc. cit.)*. Both botanically and chemically the relationship is complete between the South Australian and Tasmanian trees. It is thus shown that *E. acervula* is not endemic in Tasmania, as was previously supposed. Mr. J. H. Maiden, in his "Critical Revision of the Genus Eucalypts," vol. iii., part 7, p. 133, synonymizes this species under *E. ovata*, Labillardière, a synonymy with which we cannot agree, as the evidence advanced appears to us altogether insufficient, and Labillardière's plate and description do not match the *E. acervula* of Tasmania and South Australia.

Essential Oil.

Leaves and terminal branchlets of this species were received for distillation from the Conservator of Forests of South Australia, Mr. Walter Gill, in the month of December.

The crude oil was somewhat viscid, and had an aromatic odour. It evidently consisted largely of high-boiling constituents, such as sesquiterpene; it was dark coloured, and a phenol was present in fair amount for a Eucalyptus oil. A solid paraffin was also present. Phellandrene was absent, and cineol was present only in small amount. The ester content was somewhat high, the saponification number for the esters and free acids, in the cold with alcoholic potash, being 40·7. The separated oil had a marked odour of geraniol, so that the principle ester consisted of geranyl-acetate. The amount of this ester in the oil of this South Australian tree may thus be stated to be 14 per cent. Geranyl-acetate has been isolated from the oils of several Eucalyptus species, and in one instance *(E. Macarthuri)* over 70 per cent. of this ester has been found.

The crude oil had specific gravity at 15° C. = 0·9307; rotation, $^{a}D - 1·4°$; refractive index at 20° C. = 1·487, and was soluble in one volume 80 per cent. alcohol, but became very turbid on addition of excess of alcohol. The high specific gravity, refractive index, and colour reactions suggest the presence of a fair amount of sesquiterpene. The large amount of ester renders the oil somewhat soluble in alcohol, but with excess of alcohol the presence of a solid paraffin in some quantity is indicated.

The results of the analysis of this oil, as shown above, very closely resemble those we obtained for *E. acervula* from Tasmania. This is particularly noticeable through the ester and the solid paraffin, and allowing for differences in yield of oil and a consequent lower specific gravity in the Tasmanian material, the physical characters may be considered in agreement.

The presence of the aromatic alcohol, geraniol, in the oil of this South Australian tree is worthy of reference, in view of Hooker's remarks in his "Flora Tasmaniae," in which he states "that the bruised foliage has a much sweeter odour than is usual in the genus." This observation was made over fifty years ago.

24. Eucalyptus viminalis, Labill. (Pl. New Holl., ii., 126 to 151).

"Manna Gum."

Few species of Eucalypts are so widely distributed in Australia as *E. viminalis*, consequently it has several common names, the most general being "Manna Gum." It is restricted to the south-eastern portion of this State. A full systematic description and plate, as well as other relevant matter on the species, are given in Brown's "Forest Flora of South Australia," 1882.

It is botanically and chemically described in our work on "Eucalypts and their Essential Oils," p. 137.

25. Eucalyptus rostrata, Schlecht. (Linnea. xx., 655).

"Red Gum."

Being a distinct tree, and easily recognized from its location, very little confusion has occurred in connection with the nomenclature of this species. It is almost invariably found on the banks of rivers, billabongs, and courses of old rivers. Its most common name is "Murray Red Gum," but it has a much larger distribution than that name implies.

It is, perhaps, more largely cultivated abroad than any any other species except *E. globulus*. Its specific characters appear not to vary wherever the tree is exotically grown.

The oil from the variety *borealis* of this species ("Research on the Eucalypts," p. 75) differs entirely from that of *E. rostrata*, but in itself is just as constant. We have now had material of this variety from several localities, recently from Victoria, and the oil from all these is in agreement. There are thus two distinct forms of *E. rostrata*, and it is our intention to eventually raise the variety *borealis* to specific rank.

Essential Oil:

Leaves and terminal branchlets of this species for distillation were collected at the Kingscote end of Kangaroo Island in the month of June.

The average yield of oil was 0·38 per cent. The crude oil was dark coloured—due to the influence of the phenols—and had a strong secondary odour of aromadendral. Cineol was present, but in small amount, and a small quantity of phellandrene was detected; cymene was present in some quantity. The oil from this material gave results which were in entire agreement with those published by us in 1902 for this species ("Research on the Eucalypts," p. 139), from material collected at Albury and at Hay, New South Wales localities.

The crude oil of the Kangaroo Island *E. rostrata* had specific gravity at 15° C. = 0·9047; rotation, $^{a}D - 12·4°$; rafractive index at 20° = 1·4890, and was soluble in one volume 80 per cent. alcohol. The saponification number of the esters and free acid was 6·1. On rectification a few drops of acid water and some aldehydes came over below 173° (corr.). Between 173-188°, 51 per cent. distilled; between 188-255°, 30 per cent. came over, and between 255-272°, 7 per cent. distilled. These fractions gave the following results:—

	Sp. gr at 15° C.	Rotation a_D.	Ref. index at 20°.
First fraction	0·8710	− 7·5°	1·4811
Second fraction	0·9127	−21·2°	1·4929
Third fraction	0·9333	—	1·5040

The left rotation of the first fraction is partly due to the phellandrene, while that of the second fraction is almost entirely owing to the aromadendral. The high refractive

index of the first fraction, taken in conjunction with the low specific gravity, is due to the influence of the cymene.

The cineol was determined by the resorcinol method in the first fraction. When calculated for the crude oil the result indicated that 11 per cent. of that constituent was present.

For the determination and identification of the low-boiling constituents in the oil of this species another portion was distilled. The oil which came over below 185° C. was added to that of the first distillation and the whole redistilled, using a fairly long rod and disc stillhead. Although commencing to distil at 157°, yet only 7 per cent. distilled below 170° C. (corr.); by 173° 38 per cent. had come over. The three fractions were separated as follows: 157-173°, 38 per cent.; 173-175°, 31 per cent.; 175-179°, 15 per cent.; residue boiling above 179°, 16 per cent.

The results obtained with these fractions were as follows:—

	Sp. gr. at 15° C.	Rotation a_D.	Ref. index at 20°.
First fraction	0·8647	− 4·5°	1·4777
Second fraction	0·8676	− 6·4°	1·4806
Third fraction	0·8714	− 7·2°	1·4812
Residue	0·9063	−17·8°	1·4880

It is thus evident that the amount of pinene can be but small, and that it is either inactive or slightly laevorotatory. The high refractive index, taken with the low specific gravity, suggests the presence of cymene.

Cineol was detected in all three fractions, and as this constituent was small in amount an endeavour was made to remove it by agitating each fraction with 50 per cent. resorcinol. The uncombined portions were removed, washed, and dried. The influence of cineol is shown from the following figures, when compared with those given above:—

	Sp. gr. at 15°.	Ref. index at 20°.
First fraction ...	0·8613	1·4805
Second fraction ...	0·8649	1·4842
Third fraction ...	0·8667	1·4856

Cymene.

The analytical results suggested the presence of cymene, and to determine the identity of this hydrocarbon a portion of the rectified oil, thought to contain the cymene in greatest quantity, was treated in the cold with a dilute solution of potassium permanganate, and the oil unacted upon removed. The oil was then oxidized by an aqueous solution of potassium permanganate (12 grams $KMnO_4$ in 330 grams water), as suggested by Wallach: about 2 grams of oil at the time were added, and the solution heated on a rapidly boiling waterbath. When the reaction was completed the MnO_2 was filtered off, the filtrate evaporated to dryness, the salt boiled out by alcohol, evaporated to small bulk, water added and acidified with sulphuric acid. The separated acid was purified from alcohol; it then melted at 155-156° C. From the method of formation of this substance, and its melting point, there seems little doubt but that the acid formed was p-oxyisopropylbenzoic acid. This result, together with other factors, indicates the presence of p-cymene in the oil of this species. That this hydrocarbon occurs in the oil of *E. rostrata* in some quantity is thus shown.

Aromadendral.

Messrs. Schimmel & Co. have not as yet recognized aromadendral as an aldehyde differing from cumin aldehyde, and in "Die Atherischen Öle," published by this firm in 1910, they state that cumin aldehyde occurs in the oils of several Eucalypts, which are there enumerated, page 440. Cumin aldehyde may occur in the oils of some Eucalyptus species, and perhaps does, but as this aldehyde does not contain an asymmetric carbon atom it cannot be active to light, and consequently, on theoretical grounds alone, cannot be identical with the laevorotatory aldehyde which occurs in so many Eucalyptus oils; often, as in the case of *E. rostrata* and *E. salubris*, with a very high specific rotation.

As this aldehyde occurs in some quantity in the oil of *E. rostrata*, as well as the oils of several other species here dealt with, it was thought advisable to isolate it in a pure condition from the oil of a Kangaroo Island tree and determine the properties of the aldehyde from this source.

Aromadendral appears to be a dihydroaromatic aldehyde having the formula $C_{10}H_{14}O$. This formula was originally

given to this laevorotatory aldehyde by one of us when it was first announced (Roy. Soc. N.S.W., 1900, p. 286).

In Schimmel & Co.'s work, above quoted, p. 449, appears a description of a tetrahydroaromatic aldehyde (Phellandral) obtained from water fennel oil. It thus appears that the three aldehyhes—cumin aldehyde, aromadendral, and phellandral—form the series $C_{10}H_{12}O$, $C_{10}H_{14}O$, and $C_{10}H_{16}O$. The two last show optical activity, the former is inactive.

That both active forms of aromadendral occur in Eucalyptus oils is suggested from the fact that the degree of rotation varies greatly in the several species which contain it, although the predominant dextrorotatory form has not yet been isolated; also that the oxime prepared with the aldehyde extracted from the mixed high-boiling fractions of numerous Eucalyptus oils in which it occurs, melted at 84-85° C., which is the melting point for the oxime of aromadendral. That aromadendral is a definite chemical substance is demonstrated by the uniformity shown by the aldehyde when prepared from Eucalyptus species growing many hundreds of miles apart.

Aromadendral was extracted from the higher-boiling portion of the oil of *E. rostrata* by the aid of sodium bisulphite in the usual manner. When purified it had an odour reminding of cumin aldehyde, was almost colourless, being slightly yellow in appearance, and was highly laevorotatory. The specific gravity at 20° C. = 0·9534; specific rotation, $[a]_D - 73{\cdot}94°$; refractive index at 20° = 1·5066; the oxime melted at 84-85°, and the phenylhydrazone at 105-106° C. By arranging these results in tabulated form with those of cuminaldehyde the differences appear distinctly marked. The corresponding figures for phellandral, as given by Schimmel and Co., are also added for comparison:—

	Cuminaldehyde.	Aromadendral.	Phellandral.
d 15° C.	0·9818	0·9569	0·9445
Optical rotation	*Nil*	$[a]_D - 73{\cdot}94°$	$a_D - 36{\cdot}30°$
m.p. oxime ...	58-59°	84-85°	87-88°
m.p. phenylhydrazone	126-127°	105-106°	122-123°
Ref. index at 20°	—	1·5066	1·4911

For further reference in connection with aromadendral see our work, "Research on the Eucalypts," 1902, p. 218.

26. Eucalyptus cosmophylla, F. v. M.

(Trans. Vict. Inst., 32).

"Scrub Gum."

So far as known, this Eucalyptus is endemic to South Australia. Though generally a medium tree, yet it occasionally attains large dimensions, according to Mr. Gill. It extends to Kangaroo Island.

Essential Oil.

Leaves with terminal branchlets of this species for distillation were received from the Conservator of Forests, Mr. Walter Gill. The material was collected in the month of December. The average yield of oil was 0·62 per cent. The crude oil was light orange-brown in colour, with an odour indicative of an oil belonging to the cineol-pinene group, with a secondary odour suggestive of the aldehyde aromadendral. The presence of volatile aldehydes was particularly marked. The slight laevorotation of the crude oil is largely due to the aromadendral, although the pinene is also laevorotatory to a small extent. Phellandrene was absent. This left rotation is unusual with oils of this class, as in most cases the pinene shows a predominant dextrorotation. The cineol content is only fair, and the oil does not contain constituents having special characters. The species has, therefore, little value as an oil-producing tree.

The crude oil had specific gravity at 15° C. = 0·9108: rotation, $^{a}D - 3·2°$; refractive index at 20° = 1·4659, and was soluble in 7 volumes 70 per cent. alcohol. The saponification number for the esters and free acids was 5·6.

On rectification a few drops of acid water, together with some aldehydes, came over below 167° (corr.). Between 167-172°, 9 per cent. distilled; between 172-198°, 75 per cent. came over, and between 198-270° 11 per cent. distilled. These fractions gave the following:—

	Sp. gr. at 15° C.	Rotation a_D.	Ref. index at 20°.
First fraction	0·8909	−2·6°	1·4612
Second fraction	0·9065	−3·0°	1·4628
Third fraction	0·9296	−3·3°	1·4827

The cineol was determined by the resorcinol method in the rectified portion: the result showed the presence of 50

per cent. of that constituent in the crude oil. The rectified oil was tinged yellow, a peculiarity common to the oils of this group. This colour is traceable to quinone influence derived from the peculiar form of phenol present in the oils of the cineol class, other than those of the "Peppermints" and the "Ashes." The phenol (tasmanol) which occurs in the oils of these latter groups contains a methoxy group, so that quinone is not an oxidation product, and consequently the rectified oils obtainable from species belonging to these groups are colourless.

27. Eucalyptus leucoxylon, F. v. M.

"Blue Gum."

This species was described first by Baron von Mueller in the Transactions of the Victorian Institute, i., 33, 1854, and again in 1860-1861 in his "Fragmenta," ii., p. 60, but in this latter he includes the "Ironbark" now recognized as *E. sideroxylon*, so that that description is a composite one; and Mueller, in his "Eucalyptographia," further perpetuates the error.

Woolls (Proc. Linn. Soc. N.S. Wales, 1886, p. 859) details the differences of the two species, so that he is really the author of the species.

J. E. Brown, late Conservator of Forests, South Australia, describes and figures the species with three plates, dividing it into four varieties, *viz.*:—

(a) The "Blue Gum," small fruits and white flowers.

(b and *c)* "White" and "Red Flowering Gum," with large fruits; var. *macrocarpa*.

(d) The "Scrubby Blue Gum"; var. *pauperita*.

We are inclined to regard, until further investigated, *(b* and *c)* as type, *(a)* just a white variety of the type, and *(d)* as a distinct form, deserving specific rank.

Essential Oil.

Leaves and terminal branchlets of this species for distillation were collected at the Kingscote end of Kangaroo Island in the month of June. This species grows somewhat plentifully on Kangaroo Island, and is stated to have both red and white flowers. It seems to be generally known throughout the island as "Blue Gum."

The leaves, after steam distillation, had become quite red in colour, resembling in this respect those of the "Red Mallee." The average yield of oil was 0·78 per cent. The crude oil was reddish in colour, due to the influence of iron from the still acting on the phenol. The odour was that given by oils belonging to the cineol-pinene class, and volatile aldehydes were pronounced. No indication was given for the aldehyde aromadendral. Phellandrene was not present. The terpenes present were pinene and limonene, and probably cymene occurs also. A fairly large fraction was obtained boiling above 260° C., which consisted principally of a sesquiterpene. The amount of esters was small.

The crude oil had specific gravity at 15° C. = 0·8987; rotation, $a_D + 9·2°$; refractive index at 20° C. = 1·4711; and required 1 volume of 80 per cent. alcohol to form a clear solution. The saponification number for the esters and free acids was 3·8.

On rectification a few drops of acid water, together with some aldehydes, came over below 165° C. (corr.). Between 165-172°, 34 per cent. distilled; between 172-225°, 50 per cent. came over, and between 225-276° 13 per cent. distilled. These fractions gave the following results:—

	Sp. gr. at 15° C.	Rotation a_D.	Ref. index at 20°.
First fraction	0·8815	+15·9°	1·4650
Second fraction	0·8921	+ 5·8°	1·4667
Third fraction	0·9365	Inactive	1·4964

The cineol was determined by the resorcinol method in the rectified oil and calculated for the crude oil. The result obtained with two closely-agreeing determinations showed that 32 per cent. of cineol was present in the crude oil.

The Terpenes.

When the cineol in the oil of the first two fractions was combined with phosphoric acid in excess, the terpenes separated from the thick jelly formed and could be poured from the cineol phosphate. After agitating with 50 per cent. solution of resorcinol, the separated liquid, after well washing and drying, had specific gravity at 15° = 0·8641; rotation, $a_D + 11·8°$; refractive index at 20° = 1·4756.

The oil was tinged yellow, and had an odour reminding somewhat of cymene, and was very mobile. The terpenes were redistilled, when 50 per cent. came over between 157-

167° (corr.), and 34 per cent. between 167-172° C. These two fractions gave the following results:—

	Sp. gr. at 15° C.	Rotation a_D.	Ref. index at 20°.
First fraction	0·8604	+17·5°	1·4715
Second fraction	0·8569	+ 9·1°	1·4746

The nitrosochloride was readily formed with the first fraction, and this, when purified, melted at 104° C. It is thus evident that the chief terpene in the oil of this species is dextrorotatory pinene.

The specific gravity and refractive index suggest that the other terpene is limonene, and probably cymene is present also. The oil of this species is thus shown to contain a predominance of terpenes.

28. Eucalyptus fasciculosa, F. v. M.
A "White Gum."

Mueller described this tree in Trans. Vict Inst., vol. 34, but Bentham, 1866, "Flora Australiensis," vol. iii., p. 212, synonymizes it under *E. paniculata*; Mueller, in his "Eucalyptographia," 1879, concurs in such a classification, but Maiden, in Trans. Roy. Soc. S. Aus., 1908, p. 280, shows that these two are distinct, and as this is not an "Ironbark" they should be separated.

It is another instance proving that something more is required in the specific determination of Eucalypts than a morphological comparison of leaves, fruits, etc.

J. E. Brown figures and describes it in his "Forest Flora of South Australia," p. 46, under the name of *E. paniculata*. There can be no doubt that the flowers, leaves, and fruits there figured much resemble *E. paniculata*, and there is also a strong connection in the chemistry of the oils of the two species, but the timbers, bark, and *habitat* well indicate the specific differences.

Essential Oil.

Leaves with terminal branches of this species were received for distillation from the Conservator of Forests of South Australia, Mr. Walter Gill, in the month of December.

The average yield of oil was 0·019 per cent., only one ounce of oil being obtained from 329 lb. of material. The species is thus a very poor oil-producing Eucalypt. The crude oil was somewhat mobile, of a dark-amber colour, and an

odour indicating an oil of the pinene-cineol group. The amount of cineol was small—certainly not more than 15 per cent. of that constituent being present. The saponification number for the esters and free acids was 22·1, which, for an alcohol belonging to the $C_{10}H_{17}OH$ series, in combination with acetic acid, represented 7·7 per cent. of ester. The odour of the separated oil was not distinctive and did not indicate geraniol, so that the identity of the alcohol is at present in doubt.

The crude oil had specific gravity at 15° C. = 0·9041; rotation, $^{a}D + 6·3°$; refractive index at 20° = 1·4789, and was scarcely soluble in 10 volumes 80 per cent. alcohol.

The small amount of oil at our disposal did not permit more extensive work being done upon it, and distillation results could not be obtained. The species has no value as an oil-producing tree, the yield of oil being so small.

29. Eucalyptus coriacea, A. Cunn. (Schau. in Wdlp. Rep., ii., 925).

"Cabbage Gum."

This species appears to be restricted to the South-eastern portion of the State, near the coast. Sufficient research has not yet been undertaken to determine definitely this South Australian tree's relationship with *E. phlebophylla:* so that until this is ascertained, it is impossible to say which data given under the two species in the botanical and chemical descriptions in "Eucalypts and their Essential Oils," p. 179, and "Eucalypts of Tasmania and their Essential Oils," p. 27, respectively belong to the South Australian Eucalypt.

30. Eucalyptus corynocalyx, F. v. M. ("Frag." ii., p. 43).

"Sugar Gum."

Mueller, when describing this Eucalyptus in 1860 gave it this name, which was acknowledged by Bentham in his "Flora Australiensis," vol. iii., p. 218 (1886). It appears, however, that in 1852 Mueller had already described the same species under the name of *E. cladocalyx*, but discards this for *E. corynocalyx* in his "Eucalyptographia," 1879, and Bentham follows his wishes. He must evidently have had some sound reasons for such alteration of nomenclature, and now that the name *E. corynocalyx* runs through Eucalyptus literature of the last fifty years we have decided to fall into line with the author's wishes and use *E. corynocalyx*, and not exhume the name of *E. cladocalyx*.

Essential Oil.

Leaves and terminal branchlets of this species for distillation were collected at the Kingscote end of Kangaroo Island in the month of June.

The yield of oil was very small, only three ounces being obtained from 194 lb. of material, equal to 0·096 per cent. The crude oil was of an orange-brown colour, and the odour resembled that of an oil belonging to the cineol-pinene group. The secondary odour was indefinite. Phellandrene does not occur in the oil of this species. The crude oil had specific gravity at 15° C. = 0·8945; rotation, $a_D + 8·1°$; refractive index at 20° = 1·4779, and was soluble in 4 volumes of 80 per cent. alcohol. The saponification number for the esters and free acids was 7·7.

On rectification a few drops of acid water, with some aldehydes, came over below 159° C. (corr.). Between 159-167° 28 per cent. distilled, and between 167-205° 53 per cent. came over; the residue thus represented 19 per cent. As the amount of available oil was small, less than half the usual quantity was available for distillation. These fractions gave the following results:—

	Sp. gr. at 15° C.	Rotation a_D.	Ref. index at 20°.
First fraction	0·8718	+20·9°	1·4670
Second fraction	0·8816	+11·1°	1·4738
Residue	0·9548	—	1·5007

The cineol was determined by the resorcinal method in the rectified oil, and when calculated for the crude oil the result showed that 20 per cent. of that constituent was present. The oil of this species thus shows strong resemblance to those distilled from *E. microcorys* and *E. maculata*. The chief terpene is dextrorotatory pinene. The species has little value as an oil-producing Eucalypt.

31. Eucalyptus obliqua, L'Her.

"Stringy Bark."

This widely-known species of the Eastern States extends to South Australia, and along with *E. capitellata* and *E. macrorhyncha* is the most common species in the ranges of the South-east, extending across to Kangaroo Island.

It is botanically and chemically described in our work on

"Eucalypts and Essential Oils," p. 188, and figured by J. E. Brown in his "Forest Flora of South Australia."

5.—TABULATED RESULTS WITH THE CRUDE OILS, TOGETHER WITH THEIR PRINCIPAL CONSTITUENTS.

Table (A).—Species now Investigated.

The full analysis of the oil of any particular Eucalypt will be found described under that species. Constituents, other than those enumerated, may be present in small amount in many of the oils. Volatile aldehydes were present in small quantities in all the oils, and free acid also, because the small amount of water which always came over first on distillation was acid to litmus. The saponification number includes that for the free acid as well as for the esters; it will be noticed that the oil of two species had a somewhat high saponification number. All the oils contain phenols in small amount. The alcohol used in determining the solubilities was standardized for percentage of absolute alcohol by weight. The refractive indices were taken with a Zeiss Abbé refractometer and corrected for 20° C., the factor 0·00047 being used for this purpose. The yields of oil are from material collected as would be done for commercial oil distillation.

Table (B).—Species previously Investigated.

The results recorded for the oils of species enumerated in this table are those we had previously obtained from the same species collected in other Australian States. From the numerous investigations we have undertaken with authentic material collected in localities far apart, it may be stated as a general rule that an identical species of Eucalyptus, growing under natural conditions, will furnish products chemically in agreement. This fact is borne out in this research with both *E. acervula* and *E. rostrata*—in the former case from Kangaroo Island and Tasmania, localities hundreds of miles apart. *E. obliqua* is also a good instance of this constancy, for we have had material for investigation collected in the New England district of New South Wales, and in several other localities in this State, as well as in Tasmania, and the chemical results are all in agreement. We have, therefore, no reason to suppose that the species common to South Australia and the Commonwealth will differ in their comparative chemical constancy, and for that reason have given this table of results for their crude oils for referential purposes.

TABLE (A). SPECI

Species.	Sp. gr. at 15° C.	Rotation a_D.	Saponification Number.	Ref. inde at 20° C
E. cosmophylla ...	0·9108	− 3·2°	5·6	1·4659
E. fasciculosa ...	0·9041	+ 6·3°	22·1	1·4789
E. leucoxylon ...	0·8987	+ 9·2°	3·8	1·471
E. rostrata	0·9047	−12·4°	6·1	1·4890
E. oneorifolia ...	0·9229	− 3·3°	7·4	1·4664
E. odorata	0·9193	− 1·1°	8·5	1·4637
E. corynocalyx ...	0·8945	+ 8·1°	7·7	1·477
E. dumosa	0·9041	+16·4°	3·7	1·466
E. santalifolia ...	0·884	−37·7°	4·9	1·473
E. acervula	0·9307	− 1·4°	40·7	1·487

TABLE (B). SPECI

Species.	Sp. gr. at 15° C.	Rotation a_D.	Saponification Number.	Ref. inde at 20° C
E. albens	0·9044	− 6·5°	8·5	1·4780
E. Behriana	0·9237	+ 3·7°	11·1	1·4709
E. Bosistoana ...	0·9078	+ 9·25°	3·2	1·4670
E. capitellata ...	0·9175	+ 4·4°	4·2	1·4779
E. coriaceae	0·8947	−29·3°	4·6	1·4840
E. elaeophora ...	0·9199	+ 4·97°	8·7	1·4664
E. gracilis	0·9098	+ 1·34°	6·2	1·4713
E. hemiphloia ...	0·9117	− 6·8°	5·8	1·4854
E. largiflorens ...	0·9155	+ 5·5°	8·4	1·4670
E. macrorhyncha ...	0·929	Laevorotatory	8·3	1·4740
E. microtheca ...	0·8855	−27·2°	4·3	1·4839
E. obliqua	0·8902	−26·26°	8·1	1·4878
E. oleosa	0·925	− 1·49°	4·9	1·4690
E. viminalis	0·9162	+ 3·6°	7·9	1·4799
E. Woollsiana ...	0·8956	−12·4°	9·1	1·4839

OW INVESTIGATED.

lubility in Alcohol.	Cineol, per cent., Resorcinol method, Crude Oil.	Yield per cent.	Chief Constituents.
vols. 70%	53	0·62	Pinene, cineol, aromadendral, sesquiterpenes
vols. 80%	15	0·019	Pinene, cineol, esters
vol. 80%	32	0·78	Pinene, limonene, (?) cymene, sesquiterpenes, cineol
vol. 80%	11	0·38	Cymene, aromadendral, cineol, phellandrene, pinene
vols. 70%	87	1·8	Cineol, pinene, aromadendral
vols. 70%	86	1·87	Cineol, pinene, aromadendral
vols. 80%	20	0·096	Pinene, cineol, sesquiterpenes
vol. 80%	42	0·96	Pinene, cineol, sesquiterpenes
vols. 80%	12	0·41	Pinene, limonene, cineol, sesquiterpenes
vol. 80%	Small quantity only	0·03	Pinene, geranyl-acetate, sesquiterpene, paraffin

PREVIOUSLY INVESTIGATED.

lubility in Alcohol.	Cineol, Phosphoric Acid method, approximate per cent.	Yield per cent.	Chief Constituents.
vol. 80%	30	0·10	Cineol, pinene, esters, aromadendral
vols. 70%	48	0·61	Cineol, pinene, esters, sesquiterpene
vols. 70%	38	0·97	Cineol, pinene, sesquiterpene
vol. 80%	28	0·10	Cineol, phellandrene, pinene, sesquiterpene
vol. 80%	5	0·45	Phellandrene, piperitone, cineol, sesquiterpene
vols. 70%	58	0·73	Cineol, pinene, aromadendral, esters, eudesmol
vol. 80%	15	0·90	Cineol, pinene, aromadendral
vols. 70%	20	0·55	Cineol, pinene, aromadendral
vols. 70%	50	0·67	Cineol, pinene, esters
vols. 70%	30	0·27	Cineol, phellandrene, pinene, eudesmol, esters
soluble in vols. 80%	5	0·23	Phellandrene, pinene, cineol, cymene, sesquiterpene
vol. 80%	5	0·67	Phellandrene, cineol, aromadendral, esters
vols. 70%	50	0·97	Cineol, pinene, aromadendral, sesquiterpene
vol 80%	35	0·35	Cineol, pinene, phellandrene, sesquiterpene, esters
vol. 80%	10	0·50	Cineol, pinene, esters, aromadendral

6.—BOTANICAL SURVEY OF SPECIES.

(Localities from which Specimens were received from South Australia for the preparation of this paper.)

Specimen.	Locality.	Name.
Eucalyptus capitellata	S.E. corner of S.A.	Walter Gill, F.L.S.
	Dowlingville ...	Mabel F. B. Tapp
E. macrorhyncha ...	Mount Templeton	C. N. Grenfell
E. santalifolia	Near Adelaide ...	Walter Gill, F.L.S.
	Kalangadoo	W. K. Bednall
	Glencoe	Edward H. Galle
	Kangaroo Island	E. Burgess
E. Bosistoana	Mount Templeton	C. N. Grenfell
	Sevenhills	Clara A. Chesterman
E. gracilis	Nackara For. Res.	Walter Gill, F.L.S.
	Mount Templeton	C. N. Grenfell
	Hd. of Lindley ...	E. R. Edmonds
E. odorata	South Australia ...	Walter Gill, F.L.S.
	Nuriootpa	Dr. J. B. Cleland
	Mount Templeton	C. N. Grenfell
	Gulnare	Adeline Adcock
	Blumberg	W. D. Oliver
	Clinton North ...	Kate M. Brazill
	Middleton	Julia G. Tucker
	Brownlow	Annie M. Koop
	Queen's Own Town	Marian Minns
	Palmer	Christian G. Zadow
	Sheaoak Log ...	Johann F. Schultz
	Kangaroo Island	E. Burgess
E. oleosa	Clinton North ...	Kate M. Brazill
	Rosy Pine	Essie Edwards
	Brightwood	B. O. St. B. Ayliffe
E. uncinata	Brownlow	Annie M. Koop
E. cneorifolia	Hog Bay, K.I. ...	Sidney C. Kelly
	Kangaroo Island	E. Burgess
E. dumosa	Port Augusta ...	Walter Gill, F.L.S.
	Mount Templeton	C. N. Grenfell
	Clinton North ...	Kate M. Brazill
	Callington	D. A. Melbourne
	Gulnare	Adeline Adcock
	Queen's Own Town	Marian Minns
	Kangaroo Island	E. Burgess
E. Blackburniana ...	Murray River ...	J. Staer
	Mount Templeton	C. N. Grenfell
E. calycogona	Rosy Pine	Essie Edwards
	Pinnaroo	Walter Gill, F.L.S.
E. Woollsiana	Adelaide	R. H. Cambage
E. hemiphloia	Sheaoak Log ...	Johann F. Schultz
	Callington	D. A. Melbourne
E. acervula	E. part of S.A. ...	Walter Gill, F.L.S.
	Kalangadoo	W. K. Bednall
	Mount Muirhead	E. Smith
	Prospect Hill ...	Grace McD. Bell
E. viminalis	Kalangadoo	W. K. Bednall
	Glencoe	Edward Galle

Specimen.	Locality.	Name.
E. rostrata	Mount Templeton	C. N. Grenfell
	Kalangadoo	W. K. Bednall
	Prospect Hill ...	Grace McD. Bell
	Mount Torrens ...	Sophia M. Tuck
	Kanmantoo	H. J. O'Leary
	Blumberg	W. D. Oliver
	Castle Springs ...	Elizabeth Prior
	Uroonda	The Teacher
	Lower Inman Valley	M. M. Smith
	Quorn	John C. Nadebaum
	Keyneton	Elsie A. Whitehead
	Naracoorte	William J. Gunn
	Palmer	Christian G. Zadow
	Beetaloo	Maude A. Hannan
	Queen's Own Town	Marian Minns
	Kangaroo Island	E. Burgess
	Sheaoak Log ...	Johann F. Schultz
E. cosmophylla ...	South Australia ...	Walter Gill, F.L.S.
	Prospect Hill ...	Grace McD. Bell
E. leucoxylon	Beetaloo	Maude A. Hannan
	Keyneton	Elsie A. Whitehead
	Blumberg	W. D. Oliver
	Kangaroo Island	E. Burgess
	Prospect Hill ...	Grace McD. Bell
	Middleton	Julia G. Tucker
E. fasciculosa	Prospect Hill ...	Grace McD. Bell
E. corynocalyx	South Australia ...	Walter Gill, F.L.S.
	Glencoe	Edward H. Galle
	Kanmantoo	H. J. O'Leary
	Sevenhills	Clara A. Chesterman
	Rendelsham	Maude M. Williams
	World's End Creek	Florence E. Malcome
	Beetaloo	Maude A. Hannan
	Callington	D. A. Melbourne
	Queen's Own Town	Marian Minns
	Sheaoak Log ...	Johann F. Schultz
	Kangaroo Island	E. Burgess
	Smithfield	Herbert J. Deeble
E. obliqua	Prospect Hill ...	Grace McD. Bell

7. CENSUS OF SPECIES.

1. *E. capitellata*
2. *E. macrorhyncha*
3. *E. santalifolia*
4. *E. Bosistoana*
5. *E. gracilis*
6. *E. odorata*
7. *E. oleosa*
8. *E. uncinata*
9. *E. cneorifolia*
10. *E. dumosa*
11. *E. pachyphylla*
12. *E. Lansdowneana*
13. *E. Blackburniana*
14. *E. Behriana*
15. *E. calycogona*
16. *E. incrassata*
17. *E. Woollsiana*
18. *E. albens*
19. *E. hemiphloia*
20. *E. largiflorens*
21. *E. microtheca*
22. *E. elaeophora*
23. *E. acervula*
24. *E. viminalis*
25. *E. rostrata*
26. *E. cosmophylla*
27. *E. leucoxylon*
28. *E. fasciculosa*
29. *E. coriacea*
30. *E. corynocalyx*
31. *E. obliqua*

DESCRIPTION OF PLATES.

Plate xlix. *Eucalyptus cneorifolia.*
,, l. ,, *odorata.*
,, li. ,, *calycogona.*
,, lii. ,, *oleosa.*

New Australian Lepidoptera of the Family Tortricidae.

By A. Jefferis Turner, M.D., F.E.S.

[Read October 12, 1916.]

When Mr. Meyrick undertook his revision of the Australian *Tortricina*, since published in the Proceedings of the Linnean Society of New South Wales for 1910 and 1911, I sent to him for determination every species in my collection of which I had two or more examples. There remained a number of unique examples, and these, together with more recent captures, form the subject of the present paper. All the types, with the exception of those otherwise specified, are in my own collection.

Mr. Meyrick's papers form an admirable groundwork for the study of this group. The genera are well characterized, and with proper care there is no great difficulty in their discrimination, but the species of this family will always prove a difficult study, owing to their general uniformity of pattern, together with a frequent puzzling extent of variation.

Family TORTRICIDAE.

Subfamily CARPOSININAE.

Bondia nigella.

Bondia nigella, Newm.: Tr. E. S. (n. s.), iii., 289; Meyr.: P. L. S. N.S. Wales, 1882, p. 182.

Mr. W. W. Froggatt has sent me two female examples from Moruya, New South Wales, with the note that they were bred from larvae found in plum-root galls.

Carposina smaragdias, n. sp. (*σμαραγδος*, emerald).

♀, 31 mm. Head brown mixed with whitish; face whitish. Palpi very long (5), terminal joint $\frac{1}{4}$ second; brownish. Antennae brown. Thorax bright-green, anterior margin, a transverse median line, a second line behind this, a posterior spot, and some scattered scales on patagia brown. Abdomen pale-brown. Legs brown-whitish; anterior pair brown, with pale annulations on tarsi. Forewings strongly dilated posteriorly, costa gently arched at base, thence nearly straight, apex rounded, termen slightly oblique, nearly straight, rounded towards tornus; bright-green, with scanty

brown irroration; markings brown; a large spot on base of costa containing some green scales; an incomplete fascia from $\frac{1}{3}$ costa obliquely outwards, then bent longitudinally to middle of disc, upper edge of discal portion blackish; a brown dot between discal portion and costa; a brown dot on midcosta, and three similar dots at equal intervals between this and apex; a pale subterminal fascia not reaching margins; a terminal series of dots; cilia pale-grey, obscurely barred with brownish. Hindwings and cilia pale-grey. The hindwings have 3 and 4 separate but approximated at base, not stalked as is usual in this genus.

Hab.—Northern Queensland: Kuranda, near Cairns; one specimen received from F. P. Dodd.

Carposina eulopha, n. sp. (εὐλοφος, well tufted).

♂, 18 mm. Head grey-whitish. Palpi 5; dark-grey, internal and upper half of external surface grey-whitish, the latter with a few darker scales. Antennae grey-whitish; ciliations in male 1. Thorax grey-whitish, irrorated with dark-grey and ochreous. Abdomen ochreous-whitish; from each side of base arises in male a strong pencil of long hairs directed dorsally, their apices ochreous-tinged. Legs grey; tibiae annulated with whitish; posterior pair mostly whitish. Forewings very elongate-triangular, costa straight to near apex, apex pointed, termen straight, very oblique; whitish unevenly suffused with grey and with ochreous, and irrorated with dark-fuscous; some fuscous dots on costa; a moderate crest in disc at $\frac{1}{4}$, and a second beneath and beyond, both dark-fuscous anteriorly, whitish posteriorly; numerous small tufts of raised scales; cilia grey-whitish, with an obscure darker median line. Hindwings and cilia whitish-grey.

This species should be easily known by the long basal abdominal tufts of the male.

Hab.—South Australia: Blackwood, near Adelaide, in November; one specimen received from Oswald Lower.

Carposina aplegia, n. sp. (ἀπληγιος, plain, simple).

♀, 18 mm. Head, thorax, and abdomen whitish-grey. Palpi 6; fuscous, upper edge whitish. Antennae whitish-grey. Legs grey; posterior pair whitish. Forewings rather narrow, not dilated, costa moderately arched, apex round-pointed, termen nearly straight, rounded beneath, oblique; whitish grey, with some darker grey irroration towards dorsum and termen; cilia grey. Hindwings and cilia whitish.

Hab.—New South Wales: Wentworth Falls, near Katoomba, in April; one specimen. Type in Coll. Lyell.

Subfamily PHALONIANAE.

Gen. PHAULOPHARA, nov. (*φαυλοφαρος*, meanly clothed).

Antennae of male ciliated. Palpi moderate, ascending; second joint with loose spreading hairs anteriorly forming an apical tuft; terminal joint short. Thorax with a strong posterior crest. Forewings with 2 from before angle, 7 and 8 long-stalked, 7 to termen. Hindwings with 3, 4, 5, 6, and 7 separate, parallel.

PHAULOPHARA BELOGRAMMA, n. sp.
(*βελογραμμος*, inscribed with darts).

♂, 12 mm. Head ochreous-whitish. Palpi 2; ochreous-whitish. Antennae ochreous-whitish; ciliations in male 1. Thorax fuscous; patagia, except bases, ochreous-whitish; posterior crest very long, ochreous-whitish barred with fuscous at and before apex. Abdomen dark-grey, beneath ochreous-whitish. Legs ochreous-whitish; antennae, femora, and tibiae fuscous. Forewings not dilated, costa moderately arched, apex rounded, termen obliquely rounded; ochreous-whitish, with patchy fuscous irroration; a large basal patch, its posterior edge convex; indications of a median fascia; posterior area of disc suffused with fuscous, except on four longitudinal subterminal bars, and a small triangular spot on termen shortly beneath apex; cilia ochreous-whitish, with a sub-basal fuscous line, which is interrupted opposite terminal spot. Hindwings and cilia grey.

Hab.—Northern Queensland: Evelyn Scrub, near Herberton, in January; one specimen received from F. P. Dodd. Type in Coll. Lyell.

Gen. TANYMECICA, nov. (*ταννμηκικος*, elongate).

Palpi very long, porrect; second joint extremely long, thickened with roughly-appressed hairs above and beneath; terminal joint short. Thorax with a posterior crest. Forewings without raised scales; 2 from shortly before angle, 3 and 4 stalked, 7 separate to termen, 8 and 9 stalked. Hindwings with 3, 4, 5, 6, and 7 equidistant and remote at origin; 4, 5, 6, and 7 parallel.

TANYMECICA XANTHOPLACA, n. sp. (*ξανθοπλακος*, broadly yellow).

♀, 30 mm. Head whitish. Palpi 4½; whitish, external surface brownish-tinged. Antennae fuscous. Thorax fuscous. Abdomen fuscous, tuft ochreous-whitish. Legs fuscous; all tarsi annulated with ochreous-whitish; posterior femora and tibiae mostly ochreous-whitish. Forewings elongate, not

dilated, costa moderately and evenly arched, apex round-pointed, termen sinuate, scarcely oblique; pale fuscous, with darker fuscous streaks parallel to veins; a few whitish dots in terminal portion of disc; a dark fuscous terminal line; cilia dark-fuscous, base whitish-ochreous. Hindwings with basal half pale-yellow, terminal half dark-fuscous, the line of junction irregularly dentate; cilia dark-fuscous, on tornus and dorsum pale-yellow.

Hab.—Northern Queensland: Kuranda, near Cairns, in February; one specimen received from F. P. Dodd.

Gen. EUSTHENICA, nov. (εὐσθενικος, stout).

Antennae of male very shortly ciliated. Palpi moderate, ascending, thickened with smoothly-appressed scales; terminal joint short, bent forwards. Thorax with a posterior crest. Forewings without raised scales; 2 from shortly before angle, 3 and 4 approximated at origin, 7 separate, to termen. Hindwings with 3, 4, 5, 6, and 7 separate and parallel; forked vein in cell well-developed.

EUSTHENICA MEGALAUCHA, n. sp. (μεγαλαυχος, arrogant).

♂, 26 mm. ♀, 36 mm. Head fuscous-brown, with some whitish scales between antennae. Palpi fuscous-brown. Antennae brown-whitish; ciliations in male $\frac{1}{4}$. Thorax fuscous-brown, posterior $\frac{2}{3}$ of patagia and posterior aspect of crest brown-whitish. Abdomen brownish. Legs fuscous-brown; posterior pair brown-whitish. Forewings not dilated, costa slightly arched, apex rounded, termen scarcely rounded, slightly oblique; whitish-brown, with numerous fine transverse lines and three fasciae fuscous-brown; first fascia from $\frac{1}{4}$ costa to $\frac{1}{3}$ dorsum, nearly straight; second fascia from $\frac{3}{5}$ costa to $\frac{2}{3}$ dorsum, slightly outwardly curved; third fascia from $\frac{4}{5}$ costa to tornus, nearly straight, expanding towards tornus; cilia brownish with whitish apices. Hindwings grey; cilia grey-whitish, with a grey sub-basal line.

Hab.—Northern Queensland: Kuranda, near Cairns, in January; Coolangatta, in January. Two specimens.

HELIOCOSMA DISCOTYPA, n. sp. (δισκοτυπος, disc-marked).

♂, 12 mm. Head ochreous-whitish. (Palpi broken.) Antennae ochreous-whitish; in male thickened, ciliations imperceptible. Thorax reddish-brown. Abdomen grey, towards base tinged with reddish-brown, tuft ochreous-whitish. Legs pale-fuscous; posterior pair ochreous-whitish. Forewings dilated posteriorly, costa slightly arched (apex broken), termen obliquely rounded; whitish-grey; costa tinged with reddish-brown; markings reddish-brown, narrowly edged with

ochreous-whitish; a basal patch bounded by an inwardly oblique line from $\frac{1}{4}$ costa to $\frac{1}{5}$ dorsum; a transversely oval spot resting on mid-dorsum and reaching $\frac{2}{3}$ across disc; a large apical blotch bounded by a strongly inwardly-curved line; cilia reddish-brown, on tornus ochreous-whitish. Hindwings and cilia grey.

Hab.—Queensland: Coolangatta, in March; one specimen.

Hyperxena zirophora, n. sp. (ζειροφορος, loose-robed).

♀, 17 mm. Head and thorax whitish-grey. Palpi 5; whitish-grey. Antennae whitish-grey. Abdomen grey-whitish. Legs pale-grey. Forewings elongate, slightly dilated posteriorly, costa moderately arched, apex tolerably pointed, termen nearly straight, strongly oblique; pale-grey, towards base grey-whitish; a pale-brownish subdorsal blotch, undefined towards dorsum, sharply defined towards costa, where it reaches beyond middle of disc as a bidentate process, and is margined by a whitish suffusion; an undefined pale reddish-brown terminal suffusion; cilia whitish, bases mixed with pale-brownish. Hindwings and cilia whitish.

Hab.—Victoria: Beaconsfield, in June; one specimen. Type in Coll. Lyell.

Gen. Trychnostola, nov. (τρυχνοστολος, rough-robed).

Palpi moderate, ascending, thickened with smoothly-appressed scales; terminal joint moderate. Thorax with a posterior crest. Forewings with numerous tufts of raised scales; 2 from shortly before angle, 7 and 8 separate, 7 to termen. Hindwings with basal pecten on median vein; 3 and 4 connate, 5 closely approximated to 4 at origin, 6 and 7 remote, roughly parallel, converging somewhat after origin, diverging somewhat towards termen, 7 to costa.

The presence of a basal pecten on median vein of hindwings is exceptional in this family. Type, *T. lichenitis*.

Trychnostola lichenitis, n. sp. (λειχηνιτις, mossy).

♀, 28 mm. Head whitish; face and palpi fuscous. Antennae fuscous. Thorax whitish, bases of tegulae and patagia and posterior crest fuscous. Abdomen ochreous-grey-whitish. Legs fuscous; tibiae and tarsi annulated with ochreous-whitish; posterior pair mostly ochreous-whitish. Forewings elongate, posteriorly dilated, costa slightly sinuate, arched at base and beyond middle, apex rounded, termen bowed, slightly oblique; greenish, costa and central part of disc suffused with whitish, generally strigulated with fuscous; a small median tuft of scales near base and a larger tuft at $\frac{1}{4}$,

a large tuft at $\frac{2}{3}$ at lower angle of cell, and many smaller tufts; cilia fuscous. Hindwings pale-fuscous; cilia pale-fuscous, on dorsum fuscous-whitish.

Hab.—Queensland: Mount Tambourine, in December; one specimen.

TRYCHNOSTOLA PHAEOSTICTA, n. sp.

(φαιοστικτος, dusky speckled).

♀, 15 mm. Head grey-whitish; face pale-grey. Palpi pale-grey; inner-surface grey-whitish. Antennae grey-whitish, irregularly speckled and banded with fuscous. Thorax and abdomen grey-whitish. Legs grey; tibiae and tarsi annulated with ochreous-whitish; posterior pair wholly ochreous-whitish. Forewings not dilated, costa gently arched, apex rounded, termen obliquely rounded; grey-whitish, closely strigulated with fuscous; a number of fuscous dots on costa; a transverse ridge of elevated scales at $\frac{1}{5}$ from dorsum nearly to costa, anteriorly fuscous, posteriorly grey-whitish; a number of small tufts of scales in disc; cilia grey-whitish. Hindwings pale-grey; cilia grey-whitish.

Hab.—Queensland: Mount Tambourine, in March; one specimen.

Subfamily TORTRICINAE.

ISOCHORISTA EUDROSA, n. sp. (εὐδροσος, bedewed).

♂, ♀, 12-14 mm. Head pale-ferruginous. Palpi $2\frac{1}{4}$; pale-ferruginous. Antennae pale-grey; ciliations in male minute. Thorax with a well-marked posterior crest; pale ferruginous. Abdomen grey. Legs whitish-ochreous; anterior tibiae and tarsi grey, annulated with whitish-ochreous. Forewings not dilated, costa moderately arched, apex round-pointed, termen straight, oblique; in male without costal fold; ochreous-whitish, with a lustrous sheen; markings bright-ferruginous; a fuscous dot on costa near base giving rise to an irregularly-dentate line, sharply angled on fold, representing basal patch; a fine outwardly-oblique line from $\frac{1}{4}$ costa curved inwards to $\frac{1}{3}$ dorsum, dilated towards dorsum; a strongly-marked median fascia from $\frac{1}{3}$ costa, at first narrow, below middle strongly dilated and extending on dorsum from middle to tornus, dilated portion with an acute projection upwards; a large semioval partly-fuscous spot on $\frac{2}{3}$ costa; a subapical costal spot; a slight subterminal suffusion; cilia brown-whitish, on tornus narrowly fuscous. Hindwings and cilia grey.

Nearest *I. cerophanes*, Meyr.

Hab.—Queensland: Kuranda, near Cairns; Gayndah, in September; Rosewood, in April. Three specimens.

Gen. Catamacta.

Catamacta, Meyr.: Tr. N. Z. I., 1911, p. 81; Gen. Insect. Tort., p. 9.

Antennae of male ciliated. Palpi moderate, porrect; second joint thickened with rough scales above and beneath; terminal joint short. Thorax smooth. Forewings with 7 and 8 stalked, 7 to termen. Hindwings with 3 and 4 separate, but approximated at origin, 4 and 5 connate, 6 and 7 stalked.

Distinguished from *Acropolitis* by the absence of a thoracic crest, from *Paraselena* by 3 and 4 of hindwings not remote at origin, and from *Procalyptis* by the stalking of 6 and 7 of hindwings. The genus has not been previously recorded in Australia, though known in New Zealand and India.

Catamacta hedista, n. sp. (ἡδιστος, very sweet).

♂, 20 mm. Head whitish. Palpi 2½; ochreous-whitish, external surface fuscous-tinged. Antennae pale-grey; ciliations in male ½. Thorax whitish, anteriorly tinged with greenish-ochreous. Abdomen grey-whitish. Legs ochreous-whitish; anterior and middle tibiae and tarsi annulated with fuscous. Forewings dilated posteriorly, costa scarcely arched, apex rounded, termen obliquely rounded; in male with a costal fold reaching beyond middle, broad towards base, thence narrow; whitish; costa barred with fuscous; a moderate basal patch crossed by lines of greenish-ochreous, best marked towards dorsum; a suffused greenish fascia, grey in middle, from midcosta to dorsum beyond middle, strongly dilated towards dorsum, becoming ochreous, with three fuscous dorsal dots; a greenish and grey suffusion beyond and parallel to this, from ¾ costa to termen above tornus; cilia whitish, with an interrupted grey sub-basal line, apices greyish. Hindwings and cilia grey.

Hab.—Queensland: Brisbane; one specimen.

Acropolitis tetrica, n. sp. (*tetricus*, harsh, gloomy).

♂, 28 mm. Head fuscous-brown, side tufts whitish-brown. Palpi 2½; fuscous, towards base ochreous-whitish. Antennae pale-brownish; ciliations in male ½. Thorax whitish-brown mixed with fuscous-brown. Abdomen pale-grey. Legs fuscous; tibiae and tarsi annulated with ochreous-whitish; posterior pair wholly ochreous-whitish. Forewings rather narrow, not dilated, costa gently arched near base, thence straight, apex rounded-rectangular, termen rounded beneath; a tuft of scales on dorsum near base; in male with a narrow costal fold extending to ⅓; whitish-brown suffused and irregularly spotted and blotched with dark fuscous-brown;

a large irregular-edged blotch in middle of disc giving off a process towards base, and another to $\frac{1}{4}$ costa; a broad longitudinal streak from near beyond central blotch to mid-termen; cilia fuscous brown, on apex and towards termen mixed with whitish-brown. Hindwings pale-grey, with faintly darker strigulae; cilia whitish-grey with a grey sub-basal line.

Hab.—South Australia: Adelaide, in August; one specimen, received from Dr. Pulleine.

Lamyrodes argillacea, n. sp. (*argillaceus*, clay-coloured).

♂, 12 mm. Head and thorax pale ferruginous-ochreous. Palpi whitish, external surface of tuft fuscous. Antennae grey; ciliations in male minute. Abdomen grey; tuft ochreous-whitish; anterior pair fuscous; anterior and middle tarsi fuscous, annulated with ochreous-whitish. Forewings slightly dilated posteriorly, costa nearly straight, apex pointed, termen slightly sinuate, oblique; in male without costal fold; pale ferruginous-fuscous; costa strigulated with whitish and fuscous; a whitish fascia irrorated internally, with ground-colour from $\frac{1}{3}$ costa obliquely outwards to fold, there constricted, bent inwards, and continued by a whitish line to mid-dorsum; a similar but narrower fascia from mid-costa to $\frac{3}{4}$ dorsum; a double whitish line from $\frac{2}{3}$ costa, continued as a silvery-grey outwardly-curved line to tornus; a double whitish mark on costa beyond this, and another before apex, its inner limb giving rise to a short silvery-grey line to termen above middle; some blackish scales on termen; cilia ferruginous-ochreous, on costa interrupted with whitish, and also beneath apex and on tornus, on termen with a broad basal whitish line. Hindwings and cilia grey.

Hab.—New South Wales: Glen Innes, in March; one specimen.

Gen. Glyphidoptera, nov. (γλυφιδοπτερος, notch-winged).

Palpi long, porrect; second joint very long, with rough projecting scales above and beneath; terminal joint moderate. Thorax with a strong bifid posterior crest. Forewings with termen deeply incised beneath apex, forming a broad notch opposite veins 5 and 6; 7 and 8 stalked, 7 to termen. Hindwings with discocellulars strongly angled, the end of cell having the form of a W; 3 and 4 connate, 5 somewhat approximated at base, 6 and 7 short-stalked.

A developoment of *Capua* distinguished by the strongly-notched forewings. The form of the cell of hindwings, the long palpi, and the strongly-crested thorax are additional peculiarities.

Glyphidoptera polymita, n. sp. (πολυμιτος, many threaded).

♀, 22 mm. Head reddish-brown mixed with whitish. Palpi 3½; outer-surface reddish-brown, inner whitish. Antennae fuscous-brown, towards base whitish. Thorax reddish-brown. Abdomen pale-grey; tuft ochreous-whitish. Legs whitish-ochreous; anterior and middle tarsi annulated with fuscous; posterior pair whitish. Forewings dilated posteriorly, costa strongly arched near base, thence nearly straight to near apex, apex round-pointed, termen deeply and broadly notched beneath apex, thence obliquely rounded; whitish, suffused and streaked with reddish-brown; these streaks are specially marked in cell and between posterior veins; cilia reddish-brown, with some whitish bars, best marked in notch. Hindwings and cilia grey-whitish.

Hab.—New South Wales: Glen Innes, in October; one specimen, beaten from a sapling *Eucalyptus*.

Gen. Batodes.

Batodes, Gn.: Eur. Micro., p. 40; Meyr.: Gen. Insect. Tortricidae, p. 10.

Asthenoptycha, Meyr.: P. L. S. N.S. Wales, 1881, p. 461, and 1910, p. 178.

Batodes heminipha, n. sp. (ἡμινιφος, half-snowy).

♂, ♀, 14-17 mm. Head and palpi brown. Antennae brown; ciliations in male ½. Thorax brown. Abdomen brown, tuft whitish. Legs brown; tarsi with pale annulations; posterior pair brown-whitish. Forewings strongly dilated posteriorly, costa nearly straight or slightly sinuate, apex rounded-rectangular, termen slightly rounded, slightly oblique; dorsum with a strong crest near base; brown, more or less strigulated with dark-fuscous; some whitish irroration towards dorsum; apical ⅔ of wing white, with some strigulae and a dorsal dot before tornus dark-fuscous; anterior margin of white area irregularly waved and concave; cilia pale-brownish. Hindwings and cilia grey.

Hab.—Queensland: Mount Tambourine, in November; two specimens.

Batodes ochrochyta, n. sp. (ὠχροχυτος, suffused with pallor).

♂, 12 mm. Head and thorax fuscous. Palpi fuscous; inner-surface whitish. Antennae whitish, with fine fuscous annulations; ciliations in male ⅓. Abdomen fuscous. Legs fuscous; tibiae and tarsi with whitish annulations; posterior pair whitish. Forewings somewhat dilated posteriorly, costa

rather strongly arched, apex rounded, termen obliquely rounded; costal fold in male moderately broad, extending to $\frac{1}{3}$; fuscous, median area suffused with whitish; a fuscous basal patch, containing several fine dark-fuscous transverse lines, interrupted by a median whitish suffusion; a fine dark-fuscous line, suffusedly bordered with brownish, from $\frac{2}{3}$ costa, soon bifurcating, anterior limb ending on $\frac{2}{3}$ dorsum, posterior on tornus; similar lines from $\frac{3}{4}$ costa to tornus, a short line from costa beyond this, and a line on termen; cilia fuscous. Hindwings and cilia grey.

Nearest *B. craterana*, Meyr.; distinguished by the median whitish suffusion.

Hab.—Queensland: Toowoomba, in September; one specimen.

Gen. AUTHOMAEMA, nov. (*αὐθομαιμος*, akin).

Antennae in male ciliated. Palpi moderate, porrect; second joint with projecting scales above and beneath; terminal joint short. Forewings with 3 and 4 stalked from angle, 7 and 8 stalked, 7 to termen. Hindwings with 3 and 4 connate, 5 somewhat approximated, 6 and 7 stalked.

A development of *Capua*, distinguished by the stalking of 3 and 4 of forewings. Type, *A. pentacosma*, Low.

CAPUA NAIAS, n. sp. (*ναϊας*, a water-nymph).

♂, 12 mm. Head white, slightly ochreous-tinged. Palpi whitish, external and anterior surface of second joint blackish, except towards apex. Antennae whitish, annulated with blackish; ciliations in male $\frac{1}{2}$. Thorax white, tegulae blackish. Abdomen ochreous-grey-whitish. Legs fuscous; posterior pair ochreous-whitish. Forewings slightly dilated posteriorly, costa rather strongly arched, apex pointed, termen obliquely rounded; in male without costal fold; white; markings blackish; a large spot on base of dorsum with a short posterior process reaching fold; a spot on base of costa, sometimes double, another at $\frac{1}{6}$, and a dot at $\frac{1}{3}$; an oblique fascia from midcosta to dorsum before tornus, interrupted above middle, dilated beneath interruption, constricted above dorsum; a dot on $\frac{2}{3}$ costa; four small spots on apical fourth of costa; several dots on termen; cilia white, with a few basal blackish dots. Hindwings and cilia pale-grey.

This pretty and delicate species is not like any other.

Hab.—New South Wales: Ebor, in December and January; two specimens taken in a damp cave beneath a small waterfall.

Capua acrographa, n. sp. (ἀκρογραφος, marked at the apex).

♀, 12 mm. Head and thorax ochreous-whitish. Palpi 2; ochreous-whitish. Antennae greyish, towards base ochreous-whitish. Abdomen grey. Legs fuscous; posterior pair ochreous-whitish. Forewings not dilated; costa nearly straight, apex round-pointed, termen nearly straight, oblique; ochreous-whitish; basal third of costa narrowly fuscous; an ochreous-brown, moderate, inwardly oblique fascia from costa before middle to $\frac{1}{3}$ dorsum, becoming fuscous on dorsum; disc beyond this coarsely reticulated with ochreous-brown; a blackish dot in disc beyond middle; two or three blackish dots before termen above middle; cilia ochreous-whitish, on apex broadly dark-fuscous. Hindwings pale-grey; cilia ochreous-whitish.

Allied to *C. decolorana*, Wlk.; distinguished by the inwardly oblique fascia and apical dark spot in cilia.

Hab.—Queensland: Brisbane, in June; one specimen.

Capua dasycerca, n. sp. (δασυκερκος, bushy-tailed).

♂, ♀, 12-13 mm. Head and palpi pale-brown. Antennae brownish, obscurely annulated with dark-fuscous; ciliations in male 2. Thorax brown, posterior crest dark-fuscous. Abdomen fuscous-grey; tuft dark-fuscous, very large in female. Legs pale-brownish; anterior pair fuscous, with pale annulations on tarsi. Forewings strongly dilated posteriorly, costa moderately arched, apex rounded, termen straight, slightly oblique; male with a slender costal fold to $\frac{1}{4}$; pale-brownish; a large basal patch outlined with dark-fuscous, rather acutely angled outwards below middle; a dark-fuscous median fascia, indented anteriorly and slightly projecting posteriorly in middle; a fuscous tornal spot; a dark-fuscous fascia from costa near apex, broad on costa, narrowing to its termination on termen above tornus; a fine fuscous transverse line between basal patch and median fascia, and two fine lines between that and subterminal fascia; cilia pale-brownish. Hindwings and cilia grey.

Hab.—Queensland: Killarney, in November; five specimens.

Capua tetraplasia, n. sp. (τετραπλασιος, fourfold).

♀, 11 mm. Head ochreous-whitish. Palpi 2; ochreous-whitish. Antennae ochreous-whitish. Thorax ochreous-whitish tinged with ferruginous. Abdomen grey. Legs ochreous-whitish. Forewings not dilated, costa moderately arched near base, thence straight, apex round-pointed, termen straight, slightly oblique; whitish, with a small basal patch

and four fasciae ferruginous, mixed with fuscous; first fascia from $\frac{1}{4}$ costa to $\frac{1}{3}$ dorsum, slightly outwardly curved; second fascia straight, outwardly oblique, from midcosta to $\frac{2}{3}$ dorsum; third fascia from $\frac{3}{4}$ costa, confluent on dorsum with preceding; fourth fascia from costa beyond and continuous with third to tornus; cilia ferruginous-fuscous. Hindwings and cilia grey.

Hab.—Queensland: Stradbroke Island, in August; one specimen.

CAPUA ACRITA, n. sp. (*ἄκριτος*, confused).

♂, 13 mm. Head fuscous-brown. Palpi 2; fuscous-brown. Antennae grey; ciliations in male 1. Thorax dark-fuscous. Abdomen dark-grey, basal segments brown-whitish. Legs fuscous; tarsi annulated with whitish; posterior pair whitish. Forewings not dilated, costa gently arched, apex round-pointed, termen obliquely rounded; in male without costal fold; whitish mixed with reddish-brown and a few scattered fuscous scales; markings dark-fuscous, with a few reddish-brown scales; a large basal patch limited by an irregular line from $\frac{1}{5}$ costa to mid-dorsum; median fascia sharply defined anteriorly, posteriorly suffused, broad on costa, indistinct towards termen; costal area beyond this grey, with an included dark-fuscous costal dot; a broad inwardly-oblique streak from costa before apex; a broad line from tornus $\frac{2}{3}$ length of termen, cilia whitish-grey, bases partly fuscous. Hindwings pale-grey, faintly strigulated with whitish; cilia pale-grey.

Hab.—Victoria: Gisborne, in February; one specimen. Type in Coll. Lyell.

CAPUA EUCYCLA, n. sp. (*εὐκυκλος*, well rounded).

♂, 17 mm. Head pale-grey. Palpi grey, inner-surface white. Antennae grey; ciliations in male 1. Thorax and abdomen grey. Legs grey; tarsi with whitish annulations. Forewings suboval, costa strongly arched, apex rounded, termen obliquely rounded; in male with a moderate costal fold extending to $\frac{1}{3}$; grey, with fuscous markings and irroration; basal patch ill-defined; median fascia from $\frac{1}{3}$ costa to mid-dorsum, anterior edge clearly defined, posteriorly suffused, with a median projection; a second fascia from $\frac{2}{3}$ costa to termen above tornus, anterior edge irregular, well defined; cilia whitish, obscurely barred with grey, and with a dark-fuscous median line. Hindwings and cilia grey.

Hab.—Tasmania: Huon River, in November; one specimen received from A. M. Lea.

Capua cydropis, n. sp. (*κυδρωπις*, of glorious appearance).

♀, 18 mm. Head fuscous-brown; face pale-ochreous. Palpi fuscous-brown; inner-surface pale-ochreous. Antennae fuscous-brown. Thorax with a strong posterior crest; fuscous-brown. Abdomen fuscous-brown. Legs whitish-ochreous; anterior pair suffused with fuscous. Forewings not dilated, costa strongly arched near base, thence straight, apex rounded, termen nearly straight, slightly oblique; whitish-brown; markings reddish-brown, partly edged and spotted with dark-fuscous; a moderately basal patch, produced and obtusely angled outwards in middle; a subtriangular dorsal spot from $\frac{1}{4}$ to middle; a rather broad fascia from costa before middle obliquely outwards, greatly dilated below middle, but deeply indented on posterior edge above dorsum; a triangular spot on costa about $\frac{2}{3}$, its apex confluent with fascia; subterminal and submarginal dark lines; cilia fuscous, mixed with brown. Hindwings deep ochreous towards termen, irrorated with fuscous; cilia grey, with a darker subbasal line.

Conspicuously distinct.

Hab.—Queensland: Mount Tambourine, in March; one specimen.

Capua discotypa, n. sp. (*δισκοτυπος*, disc-marked).

♀, 12 mm. Head and thorax brown. Palpi 3; brown. Antennae pale-brownish, with narrow blackish rings. (Abdomen broken.) Legs whitish; anterior and middle tibiae and tarsi fuscous, with ochreous-whitish annulations. Forewings rather narrow, strongly dilated posteriorly, costa straight, towards apex gently arched, apex rounded, termen obliquely rounded; brown-whitish, closely set with fine fuscous transverse lines and some dark-fuscous irroration; costa finely strigulated with dark-fuscous; a circular fuscous-brown blotch above $\frac{2}{3}$ dorsum, to which it is connected; a fuscous-brown fascia from $\frac{3}{4}$ costa, narrow on costa but rapidly widening, anterior edge to tornus, posterior to midtermen: three fuscous streaks from costa beyond this; cilia fuscous. Hindwings fuscous; towards base thinly scaled; cilia fuscous.

Hab.—Queensland: Mount Tambourine, in January; one specimen.

Capua eucamata, n. sp. (*εὐκαματος*, well-wrought).

♂, 14 mm. Head, palpi, thorax, and abdomen fuscous. (Antennae broken.) Legs fuscous; tarsi annulated with ochreous-whitish; posterior pair mostly ochreous-whitish. Forewings somewhat dilated posteriorly, costa gently arched, apex round-pointed, termen scarcely rounded, oblique; in male with a rudimentary costal fold to $\frac{1}{3}$; fuscous, mixed with

whitish and in places slightly tinged with ferruginous-brown; markings clearly defined, whitish, narrowly edged with dark-fuscous and ferruginous-brown; a fascia from $\frac{1}{3}$ costa to $\frac{1}{3}$ dorsum, slightly outwardly curved; a second fascia from $\frac{2}{3}$ costa to $\frac{2}{3}$ dorsum, interrupted in disc; two whitish costal dots before apex; a third fascia, subterminal, ill-defined in middle portion; cilia pale-grey. Hindwings and cilia grey.

Hab.—Victoria: Beaconsfield, in October; one specimen. Type in Coll. Lyell.

Capua vulpina, n. sp. (*vulpinus*, foxy-red).

♂, 12 mm. Head and thorax fuscous, with a purplish gloss. Palpi 5; fuscous, tinged with brown. Antennae pale-grey; ciliations in male $\frac{1}{2}$. Abdomen pale ochreous-grey. Legs ochreous-whitish; anterior pair pale-fuscous. Forewings not dilated, costa arched near base, bent at $\frac{2}{5}$, thence sinuate, apex rounded-rectangular, termen sinuate, slightly oblique; in male with a narrow costal fold to $\frac{2}{5}$; fuscous, with a dull purplish gloss, suffused, except near base, with reddish-brown; costal edge narrowly and interrupted whitish beyond middle; cilia fuscous, mixed with reddish-brown. Hindwings whitish, indistinctly strigulated with whitish-grey; cilia whitish.

Hab.—New South Wales: Stanwell Park, near Bulli, in April; one specimen. Type in Coll. Lyell.

Tortrix haematephora, n. sp. (αἱματηφορος, blood-stained).

♂, ♀, 20-23 mm. Head whitish, brownish-tinged. Palpi 3; fuscous, inner-surface whitish. Antennae grey; ciliations in male $1\frac{1}{2}$. Thorax brownish-fuscous, with a post-median white spot. Abdomen grey-whitish. Legs fuscous; posterior pair grey-whitish. Forewings elongate, not dilated, costa arched near base, thence nearly straight, apex pointed, termen nearly straight, slightly oblique; in male without costal fold; whitish, finely strigulated with pale-grey; markings grey, partly suffused, especially on margins, with bright-ferruginous, and blackish; a large basal patch, sharply toothed posteriorly below middle; a moderate fascia from $\frac{1}{3}$ costa to beyond middle of disc, there expanding into a large blotch, which extends from $\frac{2}{3}$ dorsum to tornus, and whose posterior edge is sharply toothed upwards; an elongate mark on costa from middle to near apex, containing two whitish costal dots; a fine terminal line; cilia grey-whitish, with an interrupted dark sub-basal line. Hindwings grey-whitish, with faintly darker strigulations; at apex grey; cilia grey-whitish.

Hab.—New South Wales: Mount Kosciusko (5,000 ft.), in February and March; eight specimens.

Tortrix erysibodes, n. sp. (ἐρυσιβώδης, mildewed).

♂, 18-20 mm. Head ochreous-brown; face fuscous. Palpi 3; pale fuscous. Antennae fuscous; ciliations in male $1\frac{1}{2}$. Thorax fuscous, tegulae, patagia, and a posterior spot ochreous-brown. Abdomen grey. Legs fuscous; posterior pair ochreous-whitish. Forewings elongate, not dilated, costa gently arched, apex rounded-rectangular, termen slightly oblique, towards tornus rounded; grey, with a few whitish scales; five or six irregular ochreous-brown transverse lines, containing some fuscous scales, partly connected in disc; these lines commence from fuscous costal spots; short whitish fasciae from $\frac{1}{4}$ and midcosta, lost in disc; cilia whitish, barred with pale-grey. Hindwings pale-grey, with faint darker strigulations; cilia whitish, with a grey sub-basal line.

Hab.—New South Wales: Mount Kosciusko (5,000 to 6,000 ft.), in February and March; eleven specimens. This species was abundant in the neighbourhood of the hotel.

Tortrix tephrodes, n. sp. (τεφρωδης, ashen-grey).

♂, 18-20 mm. Head grey. Palpi 2; grey. Antennae grey; ciliations in male very short ($\frac{1}{3}$). Thorax and abdomen grey. Legs grey; posterior pair ochreous-whitish. Forewings not dilated; costa arched to middle, thence straight, apex tolerably pointed, termen nearly straight, slightly oblique; costal fold narrow, to $\frac{2}{3}$; whitish, closely irrorated with grey; markings grey, with patchy ferruginous irroration; sometimes also some ferruginous irroration between markings; an ill-defined basal patch dentate outwards above middle; a short oblique fascia from costa before middle, terminating abruptly in mid-disc; a blotch on dorsum before tornus, reaching to middle of disc; an elongate mark on costa at $\frac{2}{3}$, followed by two costal dots; a short erect mark from termen just beyond tornus; a dark grey terminal line; cilia whitish, with an interrupted grey sub-basal line. Hindwings grey; cilia whitish, with a grey sub-basal line.

Hab.—New South Wales: Mount Kosciusko (3,500 to 5,000 ft.), in January and February; eight specimens.

Tortrix euraphodes, n. sp. (εὐραφωδης, well-embroidered).

♂, 15-16 mm. Head whitish; face grey. Palpi 2; fuscous. Antennae grey; ciliations in male very short ($\frac{1}{3}$). Thorax fuscous, with some whitish scales. Abdomen grey, tuft whitish. Legs fuscous, posterior pair whitish. Forewings not dilated, costa arched near base, thence straight, apex rounded-rectangular, termen nearly straight, scarcely oblique; in male without costal fold; whitish, sometimes with

slight patchy pale-ochreous suffusion; markings fuscous; a rather large basal patch, angled outwards below middle; two or three dots on dorsum; a short outwardly-oblique fascia from $\frac{1}{3}$ costa, ending abruptly before mid-disc; a large blotch on tornus; a streak along costa from middle to apex, sometimes connected with apex of fascia; a triangular spot on middle of termen, its apex sometimes connected with tornal blotch; cilia grey, apices whitish. Hindwings grey; cilia whitish, with a grey sub-basal line.

Ground-colour whiter than in the preceding species, the markings much more distinct, with a triangular spot on termen, and without costal fold.

Hab.—New South Wales: Mount Kosciusko (5,000-6,000 ft.), in March; four specimens.

TORTRIX HAEMATODES, n. sp. (*αἱματωδης*, blood-stained).

♂, ♀, 15-19 mm. Head and thorax fuscous. Palpi 2; fuscous. Antennae fuscous; ciliations in male 1. Abdomen grey. Legs fuscous; posterior pair grey-whitish. Forewings not dilated, costa gently arched, straight beyond middle, apex rounded-rectangular, termen nearly straight, slightly oblique; in male without costal fold; fuscous, sometimes dotted with dark-fuscous, usually more or less reticulated with bright-ferruginous; cilia fuscous. Hindwings and cilia pale-grey.

Hab.—New South Wales: Mount Kosciusko (5,000-6,000 ft.), in February and March; nine specimens. Among these is only one female, which is distinctly smaller than those of the other sex.

TORTRIX BALIOPTERA, n. sp. (*βαλιοπτερος*, with speckled wings).

♂, 15 mm. Head and thorax ochreous-brown. Palpi 3; ochreous-brown. Antennae ochreous-brown; ciliations in male $\frac{2}{3}$. Abdomen grey, tuft ochreous-whitish. Legs ochreous-whitish. Forewings somewhat dilated, costa strongly arched near base, thence straight, apex rounded-rectangular, termen scarcely oblique, rounded beneath; in male without costal fold: whitish, closely strigulated with pale ochreous-brown: a basal patch and median fascia faintly indicated; the latter strongly oblique from costa before middle to tornus; cilia whitish. Hindwing grey-whitish, faintly strigulated with grey; cilia whitish.

This species belongs to the *sobriana* group.

Hab.—Queensland: Brisbane, in September; Warwick, in October. Two specimens.

Tortrix celatrix, n. sp. (*celatrix*, a concealer).

♂, ♀, 19-20 mm. Head and thorax fuscous-brown. Palpi 2½; fuscous-brown. Antennae fuscous-brown; ciliations in male 2½. Abdomen grey. Legs fuscous; tarsi annulated with ochreous-whitish; posterior pair ochreous-whitish. Forewings somewhat dilated posteriorly, costa rather strongly arched, apex round-pointed, termen sinuate, oblique; in male without costal fold; dark fuscous-brown, finely strigulated with reddish-brown; costal edge strigulated with fuscous; cilia fuscous-brown. Hindwings whitish, strigulated with grey; cilia whitish, with a grey sub-basal line.

This species nearly resembles *T. ferrea*, but the much longer antennal ciliations show that it is distinct.

Hab.—Queensland: Mount Tambourine and Toowoomba, in September; three specimens.

Tortrix oriotes, n. sp. (ὀρειωτης, a mountaineer).

♂, 14-20 mm. Head fuscous, irrorated with white. Palpi 2½; fuscous, with some white irroration; base white. Antennae dark-fuscous with whitish annulations; ciliations in male 1½. Thorax dark-fuscous, with some white scales on margins. Abdomen grey; under-surface whitish. Legs fuscous irrorated, and tarsi annulated, with whitish; posterior pair mostly whitish. Forewings not dilated, costa gently arched, beyond middle straight, apex rounded-rectangular, termen straight, slightly oblique; in male without costal fold; grey; basal patch faintly indicated, mixed with dark-fuscous, pale-ochreous, and white; markings white, broadly edged, with a mixture of dark-fuscous and pale-ochreous; three outwardly oblique fasciae from ¼, ½, and ⅔, reaching to and the first slightly beyond middle of disc, the third fascia interrupted; a white costal dot beyond third fascia; a white submarginal line from apex; a dark-fuscous terminal line; cilia whitish, with a fuscous sub-basal line, on tornus fuscous. Hindwings fuscous; cilia whitish, with a grey sub-basal line, towards tornus wholly grey.

Hab.—New South Wales: Mount Kosciusko (5,000 ft.), in January and March; six specimens.

Meritastis anisocausta, n. sp.
(ἀνισοκαυστος, unevenly scorched).

♂, ♀, 11-12 mm. Head and thorax grey-whitish. Palpi ochreous-whitish; external surface of second joint fuscous. Antennae grey-whitish; ciliations in male 1. Abdomen pale-grey. Legs grey-whitish. Forewings not dilated, costa strongly and evenly arched, apex rounded, termen obliquely

rounded: grey-whitish; a large but variable fuscous basal patch, obsolete towards dorsum, sometimes faintly marked, bounded by a line from $\frac{1}{4}$ costa towards mid-dorsum; a semi-oval pale-centred costal patch extending on costa from middle to $\frac{3}{4}$, sometimes obsolete; cilia grey-whitish. Hindwings and cilia grey-whitish.

Its small size, obtusely rounded forewings, and whitish-grey forewings are characteristic, but the dark markings are inconstant.

Hab.—Northern Territory: Darwin, in October, December, and January; three specimens received from F. P. Dodd, of which one is in Coll. Lyell.

EPICHORISTA PLEUROSEMA, n. sp.

(πλευροσημος, with costal markings).

♂, 11 mm. Head whitish. Palpi whitish, with a few fuscous scales externally. Antennae whitish, finely annulated with dark fuscous; ciliations in male minute. Thorax fuscous, patagia whitish. Abdomen pale-grey. Legs fuscous; tarsi annulated with whitish; posterior pair whitish. Forewings somewhat dilated posteriorly, costa rather strongly arched, apex round-pointed, termen nearly straight, oblique; whitish, with fuscous irroration and markings; numerous dark-fuscous strigulae on costa, some of them giving rise to short fine oblique lines; basal patch obsolete; a defined fascia from mid-costa to tornus, strongly dilated and more suffused towards tornus; a terminal line not reaching tornus; cilia whitish, with a well-marked median dark-fuscous line. Hindwings with 6 and 7 stalked; grey; cilia grey.

Hab.—Queensland: Rosewood, in April; one specimen.

EPICHORISTA HYPERACRIA, n sp (ὑπερακριος, upon the heights).

♂, 12-16 mm. Head fuscous. Palpi 2; fuscous, internal surface and lower edge whitish. Antennae fuscous; ciliations in male 1. Thorax fuscous, with some pale-ochreous irroration. Abdomen dark-grey, tuft whitish. Forewings elongate, narrow, not dilated, costa slightly arched near base, thence straight, apex round-pointed, termen straight, strongly oblique; in male without costal fold; grey, irrorated with pale-ochreous; an ill-defined white costal streak; a similar median streak from $\frac{1}{3}$ to $\frac{3}{4}$, then bent upwards and suffusedly connected with preceding at apex; a third similar streak from base along fold, not reaching tornus, connected with origin of median streak; cilia white, on apex grey. Hindwings grey; cilia white, with a grey basal line.

This and the following allied species are peculiar in their elongate forewings, with strongly oblique termen and simple pattern of longitudinal streaks. There is some variability in the neuration of the hindwings; 6 and 7 may be separate or stalked, and 3 and 4, although usually separate, may be connate. They must, I think, be referred to this genus, though somewhat intermediate between it and *Tortrix*.

Hab.—New South Wales: Mount Kosciusko (6,000 to 7,000 ft.), in January; nine specimens.

EPICHORISTA LEPTOSTICHA, n. sp.

(λεπτοστιχος, with slender streaks).

♂, ♀, 17-21 mm. Head and thorax dark-grey. Palpi $2\frac{1}{2}$; grey, internal surface and lower edge whitish. Antennae grey; ciliations in male $\frac{1}{2}$. Abdomen grey, tuft whitish. Legs fuscous; posterior pair whitish. Forewings narrow, elongate, not dilated; costa slightly arched near base, thence straight, apex round-pointed, termen straight, strongly oblique; in male without costal fold; grey, irrorated with pale-ochreous; a white costal streak, rather broad at base, gradually narrowing, and not quite reaching apex; costal edge dark-fuscous near base, thence grey; a slender white median streak from $\frac{1}{3}$ to termen; sometimes short white streaks to termen above and below this; cilia grey-whitish. Hindwings grey; cilia whitish.

Larger than the preceding, the antennal ciliations shorter, the streaks more defined, median streak reaching termen, and without any streak on fold.

Hab.—New South Wales: Mount Kosciusko (5,000 to 6,000 ft), in March; seven specimens.

AROTROPHORA HEMIPLECTA, n. sp. (ἑμιπλεκτος, half-netted).

♂, 15 mm. Head fuscous-brown. Palpi 5; fuscous with a median reddish-brown streak on external surface, lower edge whitish. Antennae fuscous; in male markedly dentate with fascicules of cilia. Thorax pale-fuscous. Abdomen fuscous-brown. Legs ochreous-whitish; anterior pair fuscous. Forewings strongly dilated, costa moderately and evenly arched, apex rectangular, termen sinuate, not oblique; ochreous-whitish densely strigulated with brownish-fuscous, which forms fine wavy transverse lines in basal half of wing, and again towards apex; a darker more distinct line from $\frac{4}{5}$ costa to midtermen, in certain lights partly edged with silvery-white; cilia fuscous mixed with pale-brown. Hindwings ochreous-whitish, towards apex, termen, and tornus coarsely reticulated with blackish; cilia whitish-ochreous with some fuscous admixture at apex and tornus.

Hab.—Queensland: Coolangatta, in August; one specimen.

Cnephasia trissochorda, n. sp.

(*τρισσοχορδος*, with three chords).

♀, 17 mm. Head, palpi, antennae, thorax, and abdomen grey. Legs grey; posterior pair ochreous-whitish. Forewings slightly dilated posteriorly, costa arched to $\frac{1}{3}$, thence straight, apex round-pointed, termen nearly straight, slightly oblique; whitish-grey, with a few fuscous strigulae; markings dark-fuscous; a series of dots or short strigulae on costa; a line from $\frac{1}{6}$ costa to $\frac{1}{3}$ dorsum, slightly outwardly curved, not angled, representing edge of basal patch; a rather narrow oblique fascia from $\frac{2}{3}$ costa to $\frac{3}{4}$ dorsum, its centre paler, constricted in middle; a second hourglass-shaped fascia from $\frac{2}{3}$ costa to tornus, expanded on margins, much constricted in middle; cilia whitish-grey. Hindwings whitish, faintly strigulated with pale-grey; cilia whitish, with a pale-grey basal line.

Allied to *C. rupicolana*.

Hab.—New South Wales: Mount Kosciusko (5,000 ft:), in January; one specimen.

Schoenotenes micropolia, n. sp. (*μικροπολιος*, small grey).

♀, 12 mm. Head whitish-grey; lower part of face whitish. Palpi whitish; external surface of second joint fuscous. Antennae grey. Thorax grey. Abdomen whitish-grey. Legs whitish; anterior pair fuscous. Forewings with small tufts of raised scales, not dilated; costa moderately arched, apex rounded, termen very obliquely rounded; whitish-grey, finely strigulated with pale-fuscous; cilia whitish, with a very fine antemedian grey line. Hindwings whitish, towards apex tinged with grey; cilia whitish.

Hab.—Northern Queensland: Kuranda, near Cairns, in June; one specimen.

Schoenotenes crymodes, n. sp. (*κρυμωδης*, icy).

♂, 12 mm. Head whitish. Palpi $1\frac{1}{2}$; whitish, with some fuscous scales on external surface. Antennae whitish; ciliations in male 1. Thorax whitish. Abdomen ochreous-whitish. Legs whitish; anterior pair with some fuscous irroration. Forewings not dilated, costa gently arched, more strongly towards base, apex round-pointed, termen obliquely rounded; whitish, with pale-grey strigulae forming very ill-defined markings; numerous dark-fuscous dots on costa; basal patch faintly indicated; median fascia from costa before middle to dorsum beyond middle, scarcely traceable in disc,

dark-fuscous on margins; indications of a second fascia from $\frac{2}{3}$ costa to tornus; followed by a third incomplete fascia from costa before apex to termen above tornus; cilia whitish, with a few fuscous scales before apices. Hindwings and cilia whitish.

Hab.—New South Wales: Stanwell Park, near Bulli, in April; one specimen. Type in Coll. Lyell.

Gen. GYNNIDOMORPHA, nov. (*γυννιδομορφος*, of weak form).

Head rough-scaled. Palpi moderately long, porrect; second joint with rough projecting scales above and beneath; terminal joint short. Forewings without raised scales; all veins present and separate, 7 to costa. Hindwings with 3 and 4 separate, 5 rather widely remote, 6 and 7 stalked.

In the costal termination of vein 7 of forewings this genus agrees with *Peronea*, but differs in the absence of scale-tufts and the separation of 3 and 4 of hindwings. The latter character separates it also from *Dichelopa*.

GYNNIDOMORPHA MESOXUTHA, n. sp.
(*μεσοξουθος*, tawny in the middle).

♀, 11 mm. Head, palpi, antennae, and thorax whitish-ochreous. Abdomen grey. Legs fuscous; posterior pair ochreous-whitish. Forewings not dilated, costa gently arched, apex rounded, termen obliquely rounded; whitish-ochreous; markings ochreous-brown; a rather large basal patch, posterior edge nearly straight; an inwardly oblique, moderately broad, median fascia from midcosta to middorsum, constricted above middle; a fascia from $\frac{5}{6}$ costa to tornus, moderately broad on costa but soon narrowing to a fine line; cilia whitish-ochreous. Hindwings and cilia pale-grey.

Hab.—Northern Territory: Darwin, in March; one specimen received from F. P. Dodd.

DICHELOPA HETEROZYGA, n. sp. (*ἑτεροζυγος*, unevenly yoked).

♂, 12 mm. Head, palpi, and thorax brownish-fuscous. Antennae fuscous, with whitish annulations; ciliations 1. Abdomen dark-brown. Legs pale-brownish. Forewings narrow, not dilated, costa strongly arched, apex rounded, termen very obliquely rounded; reddish-brown mixed with fuscous and crossed by numerous broken silvery transverse lines; cilia fuscous. Hindwings and cilia dark-brown.

♀, 16 mm. Head, palpi, and thorax bright reddish-brown. Forewings with ground-colour bright reddish-brown without fuscous admixture.

Hab.—Queensland: Warwick, in October; two specimens.

Gen. Apura, nov. (*ἄπουρος*, distant, unlike).

Palpi moderate, porrect; second joint generally smooth-scaled, but with rough projecting scales above and beneath towards apex; terminal joint rather long, stout, smooth-scaled. Thorax without crest. Forewings with tufts of raised scales; 2 from $\frac{2}{3}$, 3 and 4 short-stalked from angle, 7 and 8 stalked, 7 to costa. Hindwings with cell short (about $\frac{1}{3}$), 3 and 4 stalked, 5 parallel, not approximated to 4 at base, 6 and 7 stalked.

An anomalous genus. The termination of 7 of forewings in costa is very unusual, and the structure of the hindwings is also peculiar. In general appearance the following species resembles a *Laspeyresia*, but there is no trace of a submedian pecten.

Apura xanthosoma, n. sp. (*ξανθοσωμος*, yellow-bodied).

♀, 20 mm. Head and thorax brownish-grey. Palpi 2; grey. Antennae grey. Abdomen ochreous-yellow. Legs fuscous; tarsi annulated with whitish; posterior pair, except tarsi, whitish-ochreous. Forewings scarcely dilated, costa moderately arched, apex tolerably pointed, termen slightly sinuate, not oblique; some tufts of raised scales in disc, especially large towards base; fuscous mixed with whitish and suffused with ochreous-brown especially in median area; basal patch fuscous, well defined by a slightly sinuous line from $\frac{1}{4}$ costa to $\frac{2}{5}$ dorsum; beyond this is a broad suffused whitish transverse line, and beyond this again a broad median ochreous-brown area, bounded by a fine sinuous fuscous line from $\frac{3}{4}$ costa to $\frac{4}{5}$ dorsum; terminal area strigulated with fuscous and containing a broad ochreous-brown line edged with fuscous from $\frac{4}{5}$ costa to termen above tornus; cilia fuscous, with minute white points and bronzy-purple reflections. Hindwings and cilia grey; dorsal cilia and hairs ochreous-tinged.

Hab.—Northern Queensland: Kuranda, near Cairns, in December; one specimen received from F. P. Dodd.

Gen. Trachyptila, nov. (*τραχυπτιλος*, rough-winged).

Antennae in male ciliated. Palpi rather long; second joint subascending, smooth beneath, thickened with scales on upper-surface before apex; terminal joint moderate, curved downward. Thorax not crested. Forewings with tufts of raised scales: 7 and 8 stalked, 7 to termen. Hindwings with 3 from well before angle remote from 4, 4 and 5 closely approximated at base; 6 and 7 stalked.

Similar to *Paraselena* in neuration, but with tufts of scales on forewings, and really a development of the *Peronea* group. The palpi are rather peculiar.

TRACHYPTILA MELANOSTICHA, n. sp.
(*μελανοστιχος*, black-lined).

♂, 21 mm. Head and thorax grey, with fine whitish irroration. Palpi 3; grey, internal surface whitish. Antennae grey; ciliations in male 2. Abdomen grey. Legs grey; femora and anterior coxae whitish posteriorly; tibiae and tarsi annulated with whitish. Forewings somewhat dilated posteriorly, costa gently and evenly arched, apex rounded, termen obliquely rounded; whitish-grey, with fine blackish strigulae and irroration; a blackish streak along fold from near base, thicker towards origin; cilia pale-grey. Hindwings and cilia pale-grey.

Hab.—Victoria: Birchip, in December; one specimen received from D. Goudie.

Gen. PARANEPSIA, nov. (*παρανεψιος*, akin).

Antennae in male ciliated. Palpi moderate, porrect; second joint with rough projecting scales above and beneath; terminal joint short. Thorax without crest. Forewings with small tufts of raised scales; 3 from angle, 7 and 8 separate, 7 to apex or termen. Hindwings with 3 and 4 separate, but approximated at base, 5 approximated to 4, 6 and 7 connate or short-stalked.

Differs from *Epichorista* only by the raised scales on forewings, but really belongs to the *Peronea* group. Type, *P. amydra*, Turn.

PARANEPSIA AMYDRA, n. sp. (*ἀμυδρος*, dark).

♂, 16 mm. Head and thorax fuscous. Palpi $2\frac{1}{2}$; fuscous. Antennae fuscous; ciliations in male $\frac{1}{2}$. Abdomen grey. Legs fuscous; tarsi annulated with ochreous-whitish; posterior pair ochreous-whitish. Forewings slightly dilated posteriorly, costa moderately and evenly arched, apex rounded, termen obliquely rounded, 7 to termen; in male without costal fold; fuscous; markings dark-fuscous; a large basal patch, posterior edge from $\frac{1}{4}$ costa to $\frac{2}{5}$ dorsum, acutely angled outwards in middle, and again on dorsum; a fine line from costa slightly beyond basal patch to dorsum, dilated somewhat towards dorsum; a second approximate and parallel line from costa to mid-disc; costal edge ochreous-whitish, interrupted by dark-fuscous strigulae; terminal fourth of disc finely reticulated with dark-fuscous; cilia fuscous, a darker

basal line interrupted by brown-whitish. Hindwings with 6 and 7 connate; fuscous; cilia fuscous.

Hab.—Queensland: Brisbane, in August; one specimen.

PARANEPSIA PHAULERA, n. sp. (φαυλερος, mean, paltry).

♂, 12 mm. Head, palpi, and thorax whitish-grey. Antennae grey-whitish annulated with dark-fuscous; ciliations in male 1. Abdomen grey-whitish. Legs ochreous-whitish; anterior pair pale-grey. Forewings not dilated, costa strongly and evenly arched, apex rounded, termen obliquely rounded; 7 to apex; whitish-grey, with slight fuscous irroration; a rather large basal patch indicated by fuscous irroration, bounded by a straight line from $\frac{1}{4}$ costa to $\frac{1}{4}$ dorsum; median fascia indicated by two fine parallel fuscous lines from about middle of costa to dorsum before tornus, very indistinct towards dorsum; a squarish fuscous spot on $\frac{3}{4}$ costa, and some fuscous irroration above tornus; cilia grey-whitish. Hindwings with 6 and 7 stalked; grey-whitish; cilia grey-whitish.

Hab.—Northern Queensland: Townsville, in June; one specimen received from F. P. Dodd.

SCOLIOPLECTA ARAEA, n. sp. (ἀραιος, weak, slight).

♂, 10 mm. Head and palpi whitish. Antennae whitish, with some fuscous annulations towards base; ciliations in male minute. Thorax whitish, anterior margin ochreous. Abdomen pale-grey. Legs whitish; anterior and middle tibiae and all tarsi annulated with fuscous. Forewings slightly dilated posteriorly, costa gently arched, apex rounded, termen nearly straight, scarcely oblique; whitish, with some fine fuscous strigulae; costa barred with many fuscous dots at regular intervals; some ochreous irroration towards base; an ochreous transverse fascia from $\frac{1}{4}$ costa to $\frac{1}{4}$ dorsum; a second similar but broader fascia from mid-costa to dorsum beyond middle; a third fascia from $\frac{3}{4}$ costa to termen above tornus, ochreous near costa, but mainly composed of fine fuscous strigulae; an oblique subapical fuscous costal bar joining a fine fuscous terminal line; cilia whitish, on costa with fuscous apices. Hindwings and cilia pale-grey.

Hab.—Northern Territory: Darwin, in March; one specimen received from F. P. Dodd.

SCOLIOPLECTA OCHROPHYLLA, n. sp. (ὠχροφυλλος, pale-winged).

♀, 14 mm. Head whitish-ochreous. Palpi ochreous-whitish, apex of second joint broadly fuscous. Antennae

fuscous. Thorax ochreous-whitish, with some fuscous admixture. Abdomen ochreous-grey-whitish. Legs ochreous-whitish; all tarsi and middle tibiae annulated with dark-fuscous. Forewings scarcely dilated, costa moderately and evenly arched, apex rounded, termen rounded, scarcely oblique; whitish; markings dark-fuscous, mixed with brownish-ochreous; a line from base of costa, confluent on dorsum, with an outwardly curved line from $\frac{1}{8}$ costa; a line from $\frac{1}{4}$ costa to $\frac{1}{3}$ dorsum parallel to the preceding; two or three dots on costa before middle; a narrow fascia from mid-costa to dorsum beyond middle, ill-defined and partly interrupted in disc; a costal dot beyond this; an outwardly curved line from $\frac{3}{4}$ costa to tornus, showing in oblique light some leaden-metallic dots; a submarginal line from costa before apex to midtermen; cilia ochreous-whitish, with an oblique dark-fuscous basal bar at apex and two dark-fuscous dots above tornus. Hindwings pale-grey; cilia grey-whitish, with a dark-grey sub-basal line.

Hab.—Northern Territory: Darwin, in October; one specimen received from F. P. Dodd.

Eboda cyclopleura, n. sp. (κυκλοπλευρος, with rounded costa).

♂, 12-14 mm. Head and thorax pale-fuscous. Palpi reddish-fuscous, internal surface and lower edge whitish. Antennae fuscous; ciliations in male minute. Abdomen grey, towards base whitish tinged with reddish-ochreous. Legs ochreous-whitish; anterior pair, except coxae, fuscous. Forewings not dilated, costa strongly and evenly arched, but more strongly towards base, apex obtusely rounded, termen straight, not oblique; grey, with fine transverse fuscous strigulations; a broad, interrupted purple-fuscous line on costa, becoming continuous on termen; a large ill-defined dorsal blotch whitish strigulated with ferruginous in one example, in a second example this is not developed; cilia pale-ochreous, apices grey. Hindwings pale-grey; cilia grey-whitish.

Hab.—Northern Queensland: Kuranda, near Cairns; two examples (one imperfect and of uncertain sex) received from F. P. Dodd.

Subfamily EUCOSMINAE.

Bathrotoma deloschema.

Spilonota deloschema, Turn.: P. L. S. N.S. Wales, 1914, 554.
Bathrotoma catapasta, Turn.: *l.c.*, 1915, 192.
Hab.—New South Wales: Ebor.

BATHROTOMA MELANOGRAPHA, n. sp.

(*μελανογραφος*, inscribed with black).

♂, 16 mm. Head whitish-grey. Palpi 3; dark-fuscous, upper edge and terminal joint whitish-grey. Antennae grey; in male slightly serrate, thickened and notched at $\frac{1}{5}$, minutely ciliated. Thorax whitish-grey, with a pair of dark-fuscous dots near posterior angle, bases of patagia brown. Abdomen whitish-grey. Legs fuscous; tarsi annulated with whitish, middle femora, middle and posterior tibiae grey-whitish. Forewings narrow-elongate, costa gently arched, apex rounded-rectangular, termen sinuate, slightly oblique; in male with a broad costal fold extending to middle; whitish, mixed with fuscous-grey, middle of disc suffused with brownish; a blackish median streak from $\frac{1}{4}$ to middle, bifurcated at anterior end; this is followed by a blackish spot, and this again by an oblique blackish streak towards, but not reaching, apex; all these markings are suffusedly edged with brownish; a narrow, interrupted terminal fascia of alternate dark-fuscous and whitish striae; cilia grey, with fine whitish striae, bases whitish interrupted by dark-fuscous, with a longer bar at $\frac{1}{3}$ from apex. Hindwings and cilia grey.

Hab.—New South Wales: Hornsby, near Sydney, in June; one specimen received from R. J. Tillyard.

ACROCLITA CHLOREIS, n. sp. (*χλωρηις*, greenish).

♀, 10 mm. Head pale-greenish, side tufts partly brownish-tinged. Palpi $2\frac{1}{2}$; fuscous, internal surface whitish. Antennae fuscous. Thorax greenish; patagia whitish, bases brownish-tinged. Abdomen grey. Legs whitish; tarsi grey, with whitish annulations. Forewings narrow, not dilated, costa moderately arched to middle, thence straight, apex rectangular, termen slightly excavated beneath apex, thence obliquely rounded; greenish; markings brownish, edged and mixed with dark-fuscous: three transverse lines from basal part of costa as far as fold; a broad band from $\frac{1}{3}$ dorsum, somewhat outwardly oblique, ending in a rounded extremity above middle of disc; a larger blotch with very irregular outline on dorsum from $\frac{2}{3}$ to tornus, reaching more than half across disc; a spot on midcosta and another slightly larger a little beyond this; a small tuft of raised scales before middle of disc, between two dorsal blotches; an elongate subapical spot narrowly connected with a dark-fuscous dot at apex; a fine fuscous terminal line; cilia grey-whitish, with an obscure fuscous median line, on apex fuscous. Hindwings and cilia pale grey.

Not near any other species, unless it be the following. The small tuft of raised scales on disc is a peculiar character.

Hab.—Northern Queensland: Kuranda, near Cairns, in June; one specimen.

ACROCLITA NEOTHELA, n. sp. (*νεοθηλος*, fresh-budding).

♀, 11-13 mm. Head pale-green. Palpi $2\frac{3}{4}$; greenish, inner-surface whitish. Antennae pale-grey. Thorax pale-green. Abdomen grey. Legs whitish; anterior tarsi annulated with fuscous. Forewings narrow, not dilated, costa gently arched, apex round-pointed, somewhat produced, termen sinuate, slightly oblique; green, with some scattered dark-fuscous scales; some dark-fuscous costal dots; median fascia dark-fuscous, from midcosta to tornus, interrupted below middle, above interruption broadly connected with a dark-fuscous apical spot; cilia pale-greenish, apices grey, on apex dark-fuscous. Hindwings with 3 and 4 stalked; pale-grey; cilia pale-grey.

Hab.—Queensland: Brisbane, in August and November; two specimens.

ANCYLIS ACROGYPSA, n. sp (*ἀκρογυψος*, with chalk-white apex).

♂, 9 mm. Head fuscous. Palpi fuscous, internal surface whitish. Antennae fuscous; in male slightly serrate, ciliations imperceptible. Thorax dark-fuscous mixed with whitish. Abdomen fuscous. Legs ochreous-whitish; anterior tibiae and tarsi fuscous; middle tibiae and tarsi fuscous, annulated with ochreous-whitish. Forewings narrow, somewhat constricted posteriorly, costa strongly arched near base, thence straight, apex acute and strongly falcate, termen strongly sinuate, not oblique; dark-brownish-fuscous; a large whitish suffused blotch at $\frac{1}{4}$ extending from costa to fold; beyond this are three short oblique whitish costal strigulae; several transverse whitish strigulae in dorsal area; a large terminal whitish area sharply limited by a nearly straight transverse line, immediately preceded by some leaden-grey suffusion and by a whitish spot above middle of disc; apex, two ante-apical strigulae, and a fine terminal line dark-fuscous; a small spot before apex and a larger above tornus leaden-grey; cilia ochreous-whitish, on apical process fuscous. Hindwings with 3 and 4 stalked; pale-grey; cilia pale-grey.

Hab.—Northern Queensland: Kuranda, near Cairns; two specimens received from F. P. Dodd.

EUCOSMA PHAEOSCIA, n. sp. (*φαιοσκιος*, darkly shaded).

♂, 14 mm. Head and thorax whitish, with some dark-fuscous scales. Palpi $2\frac{1}{2}$; whitish, external surface of

second joint with two broad dark-fuscous bands. Antennae grey; ciliations in male minute. (Abdomen broken.) Legs whitish, irrorated with grey; tibiae and tarsi annulated with dark-fuscous. Forewings not dilated, costa gently arched, apex round-pointed, termen obliquely rounded; in male with a strong but narrow costal fold extending to middle; fuscous; costal fold barred with dark-fuscous; a dark-fuscous basal patch; a broadly-suffused grey-whitish dorsal streak from this to $\frac{2}{3}$; a large dark-fuscous blotch in disc before middle, succeeded by a small ochreous-brown suffusion towards dorsum; a white spot in disc at $\frac{3}{4}$; a whitish suffusion at tornus; cilia white with dark-fuscous dots, one at apex, two beneath apex, one at tornus, one above tornus. Hindwings with 3 and 4 stalked; grey, thinly scaled; cilia pale-grey.

Hab.—Queensland: Nambour, in August; one specimen.

Eucosma pachyneura, n. sp. (παχυνευρος, thick-nerved).

♂, 14 mm. Head, palpi, and thorax pale ochreous-brown. Antennae pale ochreous-brown, annulated with dark-fuscous; ciliations in male minute. Abdomen dark-grey. Legs ochreous-whitish; anterior and middle tarsi fuscous, with ochreous-whitish annulations. Forewings slightly dilated, costa rather strongly arched, apex rounded-rectangular, termen sinuate, slightly oblique; in male with a narrow costal fold extending to $\frac{2}{5}$; pale ochreous-brown; costa strigulated with dark-brown; a dark-brown patch on $\frac{1}{3}$ dorsum, anteriorly suffused, posteriorly sharply defined by a slender whitish line; a narrow semi-oval dark-brown patch on dorsum before tornus, partly outlined with whitish; a brown suffusion on posterior part of costa, apex, and upper part of termen; cilia fuscous-brown, with a pale basal line. Hindwings with 3 and 4 stalked; semi-translucent, thinly covered with fuscous scales; veins densely outlined with dark-fuscous; cilia pale-fuscous, with a darker sub-basal line.

Hab.—Queensland: Sandgate, near Brisbane, in September; one specimen.

Eucosma perfixa, n. sp. (*perfixus*, pierced through).

♂, 14 mm. Head grey-whitish. Palpi 3; grey, internal surface whitish. Antennae grey-whitish; ciliations in male minute. Thorax pale-grey. Abdomen grey-whitish. Legs ochreous-whitish; anterior pair suffused with pale-grey. Forewings elongate, posteriorly dilated, costa straight to middle, thence gently arched, apex round-pointed, termen slightly sinuate, oblique; in male with a narrow costal fold to $\frac{1}{3}$; grey-whitish; costal fold grey; some dark-fuscous dots on costa beyond this; a dark-fuscous subcostal dot near base.

and another beyond this; a fine dark-fuscous longitudinal streak above middle from $\frac{1}{3}$ to apex, interrupted in centre; six or seven pale ochreous-grey oblique streaks from costa; ocellus ochreous-grey, limited by two obscure leaden-grey transverse lines; a short dark-fuscous longitudinal mark in mid-disc, preceding first transverse line; cilia grey-whitish with fuscous apices, at apex dark-fuscous. Hindwings with 3 and 4 stalked; pale-grey; cilia grey-whitish.

Hab.—New South Wales: Sydney, in August; one specimen.

EUCOSMA MELANOCOSMA, n. sp.

(*μελανοκοσμος*, adorned with black).

♂, 15 mm. Head and palpi fuscous-whitish. Antennae pale-grey; ciliations in male minute. Thorax whitish, bases of patagia fuscous. Abdomen grey. Legs ochreous-whitish. Forewings moderate, posteriorly dilated, costa gently arched, apex round-pointed, termen slightly sinuate, slightly oblique; in male without costal fold; white; markings dark-fuscous; numerous fine costal strigulae; a central sub-basal spot, closely followed by a second spot; a narrow erect triangular mark from $\frac{2}{5}$ dorsum half across disc; a similar but broader mark from $\frac{4}{5}$ dorsum; a subterminal line crossing a rather large subapical spot; an apical spot; cilia fuscous. Hindwings with 3 and 4 stalked; pale-grey; cilia pale-grey.

Hab.—Queensland: Brisbane, in October; one specimen.

EUCOSMA PERPLEXA, n. sp. (*perplexus*, confused, intricate).

♂, 14 mm. Head, palpi, and thorax whitish-brown. Antennae whitish-brown; ciliations in male minute. Abdomen grey. Legs ochreous-whitish; anterior pair suffused with fuscous. Forewings moderately broad, slightly dilated, costa moderately arched, apex rounded-rectangular, slightly produced, termen straight, scarcely oblique; in male without costal fold; whitish-brown finely strigulated with brown and fuscous; a large basal patch darker than rest of wing, bounded by a line from $\frac{1}{4}$ costa to $\frac{2}{5}$ dorsum, slightly angled on fold; median fascia represented by a dark line from midcosta to before tornus; an interrupted dark-fuscous terminal line; cilia brown. Hindwings with 3 and 4 stalked; grey; cilia grey.

Hab.—Queensland: Brisbane, in December; Killarney, in November. Three specimens.

EUCOSMA AËLLAEA, n. sp. (*ἀελλαιος*, stormy).

♀, 12 mm. Head and thorax brown. Palpi $2\frac{1}{2}$; brown-whitish, middle and apex of external surface fuscous.

Antennae grey. Abdomen brown, towards apex fuscous. Legs whitish; anterior and middle tibiae and tarsi dark-fuscous, annulated with ochreous-whitish. Forewings somewhat dilated posteriorly, costa moderately arched, apex rounded-rectangular, termen sinuate, rounded beneath, slightly oblique; pale ochreous-brown, with numerous transverse dark fuscous-brown lines; costa with alternate fuscous-brown and whitish strigulae; the latter give rise to short, slender, very oblique leaden-grey lines; a paler area on mid-dorsum; ocellus ochreous-brown with dark fuscous centre, bordered by anterior and posterior transverse leaden-grey lines; cilia fuscous, with several pale ochreous-brown bars. Hindwings with 3 and 4 stalked; brownish-fuscous, towards base paler; cilia grey, with a fuscous basal line.

Hab.—Queensland: Beerburrum, near Nambour, in December; one specimen.

Bactra psammitis, n. sp. (ψαμμιτις, sandy).

♂, ♀, 14-15 mm. Head and thorax whitish-brown. Palpi 3; whitish-brown. Antennae grey-whitish; ciliations in male minute. Abdomen grey-whitish. Legs grey-whitish; posterior pair whitish; anterior tibiae and tarsi sometimes annulated with fuscous. Forewings slightly dilated, costa gently arched, apex round-pointed, termen straight, oblique; pale ochreous-brown; numerous darker strigulae on costa, those on apical portion forming short oblique streaks; some minute fuscous-brown dots on dorsal edge; a fuscous-brown terminal line; cilia pale fuscous-brown, with a whitish basal line. Hindwings and cilia whitish.

Characterized by the long palpi; pale forewings without fuscous markings, and whitish hindwings.

Hab.—South Australia: Adelaide, in March; two specimens received from Oswald Lower.

Bactra passerculа, n. sp. (*passerculus*, a little sparrow).

♀, 16-20 mm. Head whitish-brown. Palpi 2½; whitish-brown, with a dark-fuscous streak along lower-half of external surface. Antennae grey-whitish. Thorax whitish-brown or brown. Abdomen grey. Legs ochreous-whitish; anterior tibiae and tarsi annulated with fuscous. Forewings not dilated, costa gently arched, apex round-pointed, termen straight, oblique; whitish-brown or brown; numerous fine oblique fuscous costal strigulae; a few minute fuscous dorsal dots; a fine fuscous terminal line; sometimes several fuscous dots in anterior ⅔ of central area of disc; cilia ochreous-whitish or whitish with two or three fine

fuscous lines. Hindwings whitish, with slight greyish suffusion on terminal edge; cilia whitish, with a pale-grey basal line.

This species varies in colour of forewings; in the paler examples there is a tendency to the development of fuscous spots in disc.

Hab.—Queensland: Brisbane, in January, March, and May; Stradbroke Island, in September and April. Five specimens.

BACTRA ANTHRACOSEMA, n. sp.

(*ἀνθρακοσημος*, marked with charcoal).

♀, 15 mm. Head brown-whitish. Palpi $2\frac{1}{2}$; fuscous. Antennae grey; basal joint brown-whitish. Thorax pale-brown. Abdomen grey-whitish. Legs ochreous-whitish; anterior tibiae and tarsi annulated with fuscous. Forewings not dilated, costa gently arched, apex round-pointed, termen straight, oblique; pale-brownish; markings dark-fuscous; a broadly suffused median streak from near base to apex, interrupted in disc before middle, indented on costal border at $\frac{2}{3}$, and from thence with costal edge sharply defined; numerous fine short oblique costal strigulae; some minute dorsal strigulae; a terminal line; cilia pale-brown, on apex narrowly fuscous. Hindwings and cilia grey-whitish.

Hab.—Northern Territory: Darwin, in December; one specimen received from F. P. Dodd.

BACTRA TESTUDINEA, n. sp. (*testudineus*, like a tortoise).

♂, ♀, 20-25 mm. Head reddish-brown or fuscous-brown. Palpi $2\frac{1}{2}$ to $2\frac{3}{4}$; brown. Antennae grey; ciliations in male $\frac{1}{3}$. Thorax reddish-brown or fuscous-brown, sometimes with a fuscous mark across patagia. Legs brownish or fuscous; tarsi with pale annulations; posterior pair whitish-ochreous. Forewings slightly or not dilated, costa moderately arched, apex round-pointed, termen straight, oblique; pale-brownish, more or less suffused with fuscous-brown, more so in male; numerous dark strigulae on costa and dorsum; usually some darker suffusion in mid-disc; cilia fuscous or pale-brownish. Hindwings grey; paler towards base; cilia whitish, more or less grey towards apex.

Larger than *B. passercula*, the forewings darker and the hindwings grey, not whitish.

Hab.—Queensland: Brisbane, in November, December, March, and April; four specimens.

Gen. ALYPETA, nov. (*ἀλυπητος*, joyous).

Antennae in male shortly ciliated. Palpi porrect or somewhat ascending; second joint with projecting scales above

and beneath: terminal joint short. Thorax with strong posterior crest. Forewings with a dorsal crest of scales; 7 and 8 separate; 7 to termen. Hindwings with 3 and 4 closely approximated at base, connate, or stalked, 5 approximated to 4 at base, 6 and 7 closely approximated at base.

A derivative of *Argyroploce*, distinguished only by the dorsal crest of forewings. Type, *A. delochlora*.

ALYPETA DELOCHLORA, n. sp. (δηλοχλωρος, distinctly green).

♂, 18 mm. Head green. Palpi 2½; green. Antennae grey-whitish, annulated with blackish; ciliations in male ⅓. Thorax green. Abdomen dark-fuscous. Legs ochreous-whitish; tibiae and tarsi fuscous, the latter with pale annulations. Forewings slightly dilated, costa rather strongly arched, apex rounded-rectangular, termen straight, slightly oblique; deep-green, partly suffused with bluish-green; a strong fan-shaped crest of scales from dorsum at ⅛, fuscous, its dorsal edge green; an obliquely triangular blackish mark from costa, near base, to fold, its dorsal edge somewhat dentate; some fuscous suffusion in middle of disc towards termen; some fine fuscous costal strigulae; a dark-fuscous terminal line; cilia fuscous, apical half barred with greenish, around apex ochreous-whitish barred with fuscous. Hindwings with 3 and 4 closely approximated at base; dark-fuscous, thinly scaled towards base; cilia fuscous.

Hab.—Queensland: Brisbane; one specimen received from F. P. Dodd.

ALYPETA LEPTOCHLORA, n. sp. (λεπτοχλωρος, faintly green).

♀, 12 mm. Head greenish. Palpi 2½; greenish. Antennae grey-whitish, annulated with blackish. Thorax fuscous; tegulae, patagia, and base of crest greenish. (Abdomen and legs broken.) Forewings posteriorly dilated, costa gently arched, apex rounded, termen slightly rounded, slightly oblique; fuscous; a small crest of scales on dorsum at ¼; costal edge green, strigulated with fuscous; apical portion of wing whitish, with a few greenish and fuscous scales, sharply limited by a straight line from ⅗ costa to tornus; cilia pale-fuscous. Hindwings with 3 and 4 connate; fuscous, towards base thinly scaled; cilia fuscous.

Hab.—Northern Queensland: Cairns, in July; one specimen.

ALYPETA ACLYTA, n. sp. (ἀκλυτος, inconspicuous).

♂, 14 mm. Head and thorax pale-fuscous. Palpi 2; pale-fuscous. Antennae grey; ciliations in male minute. Thorax grey-whitish, with a sub-basal ochreous-whitish band.

Legs ochreous-whitish; anterior and middle tibiae and tarsi fuscous, the latter annulated with ochreous-whitish. Forewings strongly dilated posteriorly, costa slightly arched, apex rounded, termen nearly straight, moderately oblique; whitish, closely irrorated with fuscous; a small dark-fuscous crest of scales on mid-dorsum; posterior half of costa barred with fuscous; an indistinct fuscous line from $\frac{3}{5}$ costa to tornus; cilia fuscous, with whitish points and a whitish basal line. Hindwings with 3 and 4 stalked; grey-whitish; cilia grey-whitish.

Hab.—Queensland: Brisbane, in November; Rosewood, in September. Two specimens.

ARGYROPLOCE EURYPOLIA, n. sp. (*εὐρυπολιος*, broadly grey).

♀, 19 mm. Head fuscous-brown; face upper half purple-fuscous, lower half ochreous-whitish. Palpi purple-fuscous, inner surface whitish. Antennae fuscous. Thorax reddish-brown. Abdomen fuscous. Legs whitish; anterior pair except coxae fuscous, tibiae and tarsi annulated with reddish-brown; middle tibiae expanded with scales towards apex, pale ochreous, base and a subterminal bar purple-fuscous; middle tarsi blackish with ochreous-whitish annulations; posterior tarsi grey with whitish annulations. Forewings strongly dilated, costa at first straight, very strongly arched in middle, apex rectangular, termen bowed, not oblique; pale ochreous-grey; a large basal patch, reddish-brown mixed with purple-fuscous, its outer edge nearly straight, but produced along costa to middle, where it joins a triangular apical patch of similar colour; six very oblique leaden-metallic striae from costa beyond middle, the last two longer and reaching termen; cilia fuscous, towards tornus ochreous-grey. Hindwings and cilia fuscous.

Hab.—Queensland: Brisbane, in March; one specimen received from R. Illidge. Type in Coll. Lyell.

ARGYROPLOCE EURYPHAEA, n. sp. (*εὐρυφαιος*, broadly dusky).

♀, 18 mm. Head and thorax brown-whitish. Palpi $3\frac{1}{4}$; brown-whitish, basal half of external surface brown, lower edge towards base whitish. Antennae grey. Abdomen grey, dorsum of third and fourth segments whitish-ochreous. Legs brown; tarsi annulated with whitish; middle femora whitish; posterior pair wholly whitish. Forewings dilated posteriorly, costa strongly arched, apex rectangular, termen sinuate, not oblique; fuscous-brown; some darker costal strigulae; a broad sharply-defined brown-whitish dorsal streak, above tornus its outline becomes irregular, it then extends sharply-defined to apex, so as to include the whole

terminal area; a brown spot on mid-termen, with some brown terminal dots above and below it; a series of dark-fuscous dots on dorsum; cilia whitish, three brown dots on apices above middle of termen. Hindwings dark-grey; cilia grey, apices whitish, except towards termen.

Hab.—Northern Queensland: Herberton, in January; one specimen received from F. P. Dodd.

ARGYROPLOCE TENEBROSA, n. sp. (*tenebrosus*, dark).

♀, 16 mm. Head and thorax fuscous, mixed with brownish. Palpi 3; fuscous mixed with brownish, lower edge ochreous-whitish. Antennae grey. Abdomen grey, dorsum of third and fourth segments whitish-ochreous. Legs dark fuscous; posterior pair grey; all tarsi annulated with ochreous-whitish. Forewings strongly dilated posteriorly, costa rather strongly arched, apex rounded-rectangular, termen sinuate, scarcely oblique; pale brown with patchy fuscous suffusion and dark-fuscous broken transverse lines; several leaden-grey transverse broken lines in basal half; a similar broader line from $\frac{3}{5}$ costa to termen above tornus, interrupted in disc; another from $\frac{4}{5}$ costa to termen above middle; a leaden-grey subapical dot; cilia leaden-grey, with a dark-fuscous basal line. Hindwings fuscous; cilia fuscous, apices whitish, except towards tornus.

Hab.—Northern Queensland: Kuranda, near Cairns, in June; one specimen.

ARGYROPLOCE SIDEREA, n. sp. (σιδηρεος, steely).

♀, 17 mm. Head fuscous-brown. Palpi $1\frac{1}{2}$; brown, upper part of sceond joint fuscous. Antennae fuscous. Thorax fuscous-brown, anterior edge brown. Abdomen ochreous-brown, towards apex darker. Legs fuscous; posterior pair pale-grey: all tarsi annulated with whitish. Forewings dilated posteriorly, costa moderately arched, apex rounded, termen rounded, scarcely oblique; brown, with dark-fuscous transverse broken lines; some whitish costal strigulae; several leaden-grey or steely-grey transverse lines or fasciae: several basal lines: a fascia from $\frac{1}{3}$ costa to mid-dorsum, a second from $\frac{2}{3}$ costa to $\frac{3}{4}$ dorsum, and a subterminal fascia from tornus not reaching costa; the ocellus between these contains three or four longitudinal blackish striae: cilia fuscous, towards dorsum pale-brownish, with a fuscous basal line. Hindwings and cilia grey.

Hab.—Queensland: Stradbroke Island, in February; one specimen.

ARGYROPLOCE INTRICATA, n. sp.

(*intricatus*, confused, entangled).

♀, 14 mm. Head and thorax fuscous. Palpi 2; fuscous. Antennae grey. Abdomen fuscous, with pale-ochreous irroration. Legs fuscous; tarsi with whitish rings; posterior pair mostly whitish. Forewings dilated posteriorly, costa gently arched, apex rectangular, termen sinuate, rounded beneath, not oblique; ochreous-fuscous, with dark fuscous transverse broken lines; a small crest of reddish-ochreous scales in mid-disc at $\frac{1}{4}$ and another in middle; ocellus brown-whitish, with some irregular central dark-fuscous markings, succeeded and followed by leaden-metallic striae; a leaden-metallic roundish blotch outlined with fuscous before mid-termen; an interrupted terminal reddish-ochreous line; cilia brown, mixed with dark-fuscous. Hindwings pale reddish-ochreous, broadly suffused with fuscous towards margins; cilia pale reddish-ochreous, with a fuscous sub-basal line.

Hab.—Queensland: Brisbane, in April; one specimen.

ARGYROPLOCE PHAEOSIGMA, n. sp.

(*φαιοσιγμα*, with dusky sigma).

♀, 18 mm. Head reddish-purple, mixed with ochreous-whitish. Palpi $2\frac{1}{2}$; reddish-purple mixed with ochreous-whitish. Antennae pale ochreous-grey. Thorax reddish-purple, with median and postmedian whitish transverse lines. Abdomen ochreous-brown. Legs reddish-purple; posterior pair and middle femora mostly ochreous-whitish. Forewings slightly dilated, costa moderately arched, apex rounded, termen rounded, scarcely oblique; reddish-purple, mixed with whitish and intermediate shades; a large circular dark-fuscous blotch beyond middle, touching costa, with a short process towards termen, the whole resembling an inverted σ; an incomplete whitish fascia from costa containing a few reddish-purple strigulae precedes this blotch; some whitish costal strigulae beyond blotch; a grey bar, surrounded by whitish suffusion from below $\frac{4}{5}$ costa to midtermen; a similar bar, crossed by some purple striae, from tornus nearly meeting the preceding; a reddish-purple terminal line; cilia reddish-purple. Hindwings and cilia ochreous-brown.

Hab.—Northern Territory: Darwin, in June; one specimen received from G. F. Hill.

ARGYROPLOCE EXEDRA, n. sp. (ἐξέδρος, strange, extraordinary).

♂, 18 mm. Head fuscous, with some whitish scales. Palpi 2; fuscous, lower-edge towards base and apex of second joint whitish. Antennae grey; ciliations in male minute.

Thorax fuscous, mixed with whitish. Abdomen grey, paler towards base, tuft grey-whitish. Legs fuscous; tarsi annulated with whitish; posterior pair and middle femora whitish. Forewings strongly dilated posteriorly, costa strongly arched beyond middle, apex rectangular, termen straight, rounded beneath, not oblique; fuscous, mixed with brownish and whitish; costa with alternate dark-fuscous and whitish strigulae; a whitish spot in disc at $\frac{1}{3}$ below middle, closely followed by a second spot; a squarish brown spot in disc at $\frac{2}{3}$, nearer costa than dorsum; a tranversely oval white spot, edged with fuscous, immediately following this; a brown-whitish subterminal shade, partly crossed by six dark-fuscous striae; (cilia abraded). Hindwings dark-grey; cilia grey, on dorsum whitish.

Hab.—Northern Queensland: Kuranda, near Cairns, in April; one specimen received from F. P. Dodd.

ARGYROPLOCE MYSTERICA, n. sp. (μυστηρικος, mystical).

♂, 17-18 mm. Head fuscous. Palpi 2; fuscous, mixed with whitish. Antennae grey; ciliations in male minute. Thorax fuscous, somewhat greenish-tinged, with an incomplete transverse whitish line before middle and some whitish points. Abdomen fuscous, apex of tuft whitish. Legs fuscous, with some whitish irroration, and whitish rings on tarsi; posterior pair mostly whitish. Forewings dilated posteriorly, costa moderately arched, apex rounded-rectangular, termen slightly rounded, scarcely oblique; whitish, partly purple-tinged, with some green and fuscous irroration; markings dark-green, partly mixed with dark-fuscous; a squarish spot on $\frac{1}{4}$ costa, preceded and followed by minute costal strigulae; an irregular spot at $\frac{1}{3}$ on fold; a large irregular blotch beyond middle extending to costa, but not to dorsum, sharply defined anteriorly and dorsally, where it forms a sharp angle, but fading posteriorly into a fuscous shade; three pairs of white strigulae on apical half of costa; a subterminal fascia commencing in a rounded extremity beneath costa and extending to tornus, its edges irregularly dentate; a small irregular dark-fuscous blotch on midtermen, with two dark-fuscous terminal dots above and two beneath it; cilia purple-grey, towards tornus grey-whitish. Hindwings fuscous; cilia whitish, with a grey basal line, at apex purple-tinged.

Hab.—Northern Queensland: Kuranda, near Cairns, in June; Stannary Hills. Two specimens.

Gen. ANALDES, nov. (ἀναλδης, feeble).

Antennae of male minutely ciliated. Palpi rather short, obliquely ascending; second joint with projecting scales above

and beneath; terminal joint short. Thorax with a strong posterior crest. Forewings with 3 and 4 approximated at origin, 7 and 8 short-stalked, 9 connate with 8, 10 and 11 strongly sinuate. Hindwings with 3 and 4 connate, 5 parallel, 6 and 7 stalked.

A development of *Laspeyresia*.

ANALDES HYPOLEPTA, n. sp. (*ὑπολεπτος*, somewhat delicate).

♂, 11 mm. Head and thorax brown. Palpi $1\frac{1}{2}$; brown. Antennae pale-brownish, with fine fuscous annulations; ciliations in male minute. Abdomen grey-brown, paler towards base. Legs ochreous-whitish; anterior and middle tibiae and tarsi fuscous-brown, the latter with pale annulations. Forewings narrow, somewhat dilated posteriorly, costa slightly arched, apex round-pointed, termen rounded, slightly oblique; whitish, closely suffused and strigulated with brown; costa with numerous fine fuscous-brown strigulae; a fuscous-brown spot at $\frac{1}{4}$ on fold; an inwardly oblique suffused fuscous-brown fascia from $\frac{3}{4}$ costa to mid-dorsum; cilia brown, towards tornus brown-whitish. Hindwings and cilia whitish-grey.

Hab.—Queensland: Brisbane, in September; one specimen.

LASPEYRESIA AMPHITORNA, n. sp. (*ἀμφιτορνος*, well rounded).

♂, 10 mm. Head fuscous; face brown-whitish. Palpi $1\frac{1}{2}$; brown-whitish. Antennae fuscous; ciliations in male imperceptible. Thorax and abdomen fuscous. Legs brown-whitish; anterior and middle tarsi annulated with fuscous. Forewings spathulate, broadly dilated posteriorly, costa straight, strongly bowed beyond middle, apex rounded, termen obliquely rounded, slightly indented beneath apex; brownish-fuscous, towards costa with dull purple lustre; costa faintly strigulated with ochreous-whitish, two strigulae more distinct before apex; a leaden-metallic line starting from a whitish costal strigula at $\frac{3}{5}$ obliquely outwards, bent in middle, and continued parallel with termen to tornus; between this and termen is a pale area with five short blackish streaks; a second metallic line from $\frac{4}{5}$ costa to subapical indentation; cilia fuscous. Hindwings fuscous, with some brown suffusion in middle of disc; cilia grey.

Best distinguished from its allies by the peculiarly-shaped forewings.

Hab.—Queensland: Brisbane, in December and January; two specimens.

Laspeyresia ferraria, n. sp. (*ferrarius*, relating to iron).

♀, 12 mm. Head reddish-brown; face brown-whitish. Palpi 1½; brown-whitish, with some fuscous irroration. Antennae fuscous. Thorax reddish-brown. Abdomen fuscous, towards base reddish-brown. Legs fuscous; posterior pair fuscous-whitish. Forewings slightly dilated posteriorly, costa nearly straight to middle, thence slightly sinuate, apex round-pointed, termen bowed, oblique; fuscous, with reddish-brown suffusion, especially near base and fold; five fine dark-fuscous oblique costal streaks, rather broadly margined with reddish-brown, second and third streaks moderately long, the others short; three oblique leaden-metallic costal streaks, of these the two posterior are long, angled in disc, and broadly prolonged to tornus, enclosing a reddish-brown ocellus, which contains three short blackish streaks; cilia brown, mixed with fuscous. Hindwings fuscous, towards base paler; cilia fuscous.

Hab.—Queensland: Brisbane, in March; one specimen.

Laspeyresia dyserasta, n. sp. (δυσεραστος, unlovely).

♀, 9 mm. Head, thorax, and abdomen fuscous. Palpi 3½; fuscous, lower-edge whitish. (Antennae broken.) Legs fuscous; posterior pair grey; under-surface whitish; tarsi annulated with whitish. Forewings very strongly dilated posteriorly, costa gently arched, apex round-pointed, termen indented beneath apex, scarcely rounded, oblique; fuscous; a suffused whitish spot in disc at ⅗; a series of whitish costal strigulae increasing in distinctness towards apex; a dark-fuscous line from midcosta, very obliquely outwards, sharply angled in disc, ending on ⅘ dorsum; this is preceded and followed by imperfect dull bluish-metallic lines; a similar dark-fuscous line from ⅔ costa to indentation, there angled and continued as a subterminal line to dorsum before tornus; a dull bluish-metallic line follows this as far as termen; a dark-fuscous subapical dot and three others on termen beneath indentation; cilia fuscous. Hindwings fuscous; cilia grey, with a fuscous basal line.

Hab.—Northern Queensland: Kuranda, near Cairns, in November; one specimen received from F. P. Dodd.

Laspeyresia polymetalla, n. sp. (πολυμεταλλος, richly metallic).

♂, 8 mm. Head fuscous; face whitish. Palpi 2; whitish, towards apex greyish. Antennae fuscous; ciliations in male imperceptible. Thorax fuscous; patagia mixed with whitish. Abdomen grey. Legs whitish; anterior tibiae and tarsi annulated with fuscous. Forewings scarcely dilated,

costa moderately arched, apex rounded, termen nearly straight, slightly oblique; whitish, mixed with brown and fuscous; four irregular transverse leaden-metallic lines; an ill-defined brown and fuscous median transverse fascia, its posterior edge partly enclosing a whitish discal spot; a reddish-brown and fuscous line from $\frac{3}{4}$ costa to termen below middle, followed on costa by a whitish dot; a broad reddish-brown and fuscous line around apex and along termen, enclosing a subapical whitish costal dot; cilia dark-fuscous, on tornus mixed with whitish. Hindwings grey; cilia grey, with a darker basal line.

Hab.—Northern Queensland: Kuranda, in March; two specimens received from F. P. Dodd.

Laspeyresia hilaris, n. sp. (*hilaris*, gay).

♀, 13 mm. Head yellow, mixed with blackish. Palpi 2, ascending; yellow, base of external surface blackish. Antennae dark-fuscous. Thorax dark-fuscous, towards margins mixed with yellow. Abdomen brown, apex fuscous. Legs whitish-ochreous; tarsi annulated with fuscous. Forewings dilated posteriorly, costa gently arched, apex rounded-rectangular, termen slightly rounded, slightly oblique; basal half yellow, irrorated with blackish; a dark-fuscous line with irregular edges from beneath midcosta to dorsum beyond middle; beyond this ground-colour is dull-purple, with dark-fuscous markings edged throughout with red, except for four yellowish costal dots; two transverse series of spots, partly confluent, not reaching costa, five costal strigulae and a terminal line; cilia dark-fuscous with several reddish bars. Hindwings dark-fuscous, partly suffused with pale-reddish; cilia pale-reddish, with a dark-fuscous basal line not extending to tornus.

Hab.—Northern Queensland: Kuranda, near Cairns, in October; one specimen received from F. P. Dodd.

DESCRIPTIONS OF NEW AUSTRALIAN MICRO-LEPIDOPTERA.

By OSWALD B. LOWER, F.E.S., F.Z.S., etc.

[Read October 12, 1916.]

TORTRICINA.

PHALONIADAE.

HELIOCOSMA ARGYROLEUCA, n. sp.

♂, 18 mm. Head, palpi, antennae, and thorax white, antennae tinged with ochreous, sometimes wholly ochreous. Abdomen grey-whitish. Legs greyish, anterior and middle pair infuscated. Forewings triangular, costa slightly arched towards apex; dull shining-white; markings fuscous; an oblique transverse narrow fascia, from above dorsum beyond middle to below costa at about two-thirds, edged posteriorly throughout with silvery-white, and anteriorly with pale ochreous; a narrow subcostal streak parallel and anterior to first streak; all veins towards termen finely outlined in silvery-white, the interspaces irregularly filled in with ochreous-fuscous; an inwardly oblique apical streak, irregularly edged with silvery-white; from its lower extremity proceeds a curved silvery-white narrow fascia to just above tornus; some silvery-white spots along termen; cilia silvery-white, with an ochreous bar at tornus. Hindwings very pale-fuscous; cilia whitish-fuscous, terminal half whitish-ochreous.

Allied to *incongruana*, Walk., but distinct by the silvery markings.

Hab.—Queensland: Warra, five specimens, in October.

TORTRICIDAE.

TORTRIX EVELEENA, n. sp.

♂, ♀; 20-22 mm. Head, palpi, and thorax ochreous-white, terminal joint of palpi somewhat infuscated. Antennae fuscous. Abdomen ochreous. Anterior and middle legs fuscous, banded with white, posterior pair ochreous-white. Forewings elongate, costa hardly arched, termen oblique, slightly rounded; pale ochreous-white, with purplish-leaden coloured markings: three or four small costal dots, between base and anterior edge of median patch; an isosceliform mark on dorsum at one-quarter, reaching about one-third across wing

three or four short striae on dorsum between this mark and anterior edge of median patch, and one or two similar striae near base; sometimes a few scattered spots above mark; median patch distinct, anterior edge oblique and sharply defined, from costa at one-quarter to dorsum at two-thirds, posterior edge from about middle of costa to dorsum at three-quarters; some black and ferruginous spots irregularly placed on patch; an irregular patch of striae confluent with lower two-thirds of median patch; an elongate spot on costa at three-quarters; an irregular, somewhat rounded patch on middle of termen, more or less continued to tornus, and containing two transverse series of ferruginous-black dots, first series, about five in number, on curve of patch, second series from near apex to tornus, parallel to termen; a blackish line along termen; cilia ferruginous-fuscous, terminal half ochreous. Hindwings bright ochreous; cilia grey-whitish, with a sub-basal ochreous line.

Hab.—South Australia: Yatala. Bred freely in November.

Larva.—Head shining ochreous-yellow, in earlier stages fuscous. Body cylindrical, pale-green, beneath paler, sparsely clothed with moderately long erect white hairs, dorsal stripe moderately broad, deep-green, lateral stripe pale whitish-ochreous. Legs pale whitish-yellow. The larva is very active when disturbed, feeds on leaves of *Pittosporum phillyraeoides*, pupa in spun-up leaves of plant. Appears to be gregarious.

My brother (Mr. Harold Lower), who discovered the species, tells me that he has never met with it on the wing. I have dedicated this pretty species to my sister-in-law (Mrs. Eveleen Lower), in recognition of her keen interest in entomology.

Tortrix sciota, n. sp.

♀, 18 mm. Head, palpi, antennae, and thorax ferruginous-fuscous, palpi beneath mixed with whitish. Abdomen fuscous. Legs fuscous, tibiae and tarsi obscurely banded with white, posterior pair grey-whitish. Forewings moderate, costa gently arched, termen oblique; light fuscous, minutely reticulated throughout with waved transverse dot-like lines of darker fuscous; costa between base and median band dull bronze-fuscous; a moderately broad fuscous median band, placed obliquely, reaching from middle of costa to tornus, slightly dilated on lower two-thirds; cilia bronze-fuscous. Hindwings and cilia fuscous, wings spotted with darker.

An obscure-looking insect, but at once recognizable by the single transverse fascia.

Hab.—South Australia: Stonyfell, two specimens received from S. Angel.

EUCOSMIDAE.

Acroclita catharoptis, n. sp.

♂, 14 mm. Head, palpi, antennae, and thorax dull ferruginous, palpi internally white, apex of basal joint black. Abdomen dull ochreous-fuscous. Legs dark fuscous, anterior and middle pair sometimes suffused with ferruginous. Forewings elongate, costa moderately arched, termen slightly sinuate beneath apex, then somewhat oblique; ferruginous-brown; costa obliquely strigulated with ochreous, interspaces filled in with bright ferruginous, and sometimes edged with dull leaden; an irregular dark fuscous mark on dorsum at one-third, sometimes absent, reaching fold, posterior edge distinct, anterior edge suffused; a fine leaden-metallic line, from last pair costal striae along termen to tornus; a fine fuscous line along termen; cilia ferruginous-brown, with a fuscous bar below apex. Hindwings thinly scaled, fuscous; cilia light-fuscous, with an ochreous-grey basal line and fuscous sub-basal line.

A dull-looking species, but the dorsal patch is generally present.

Hab.—Queensland: Cooktown and Kuranda, five specimens from Olive and Dodd.

Argyroploce irrorea, n. sp.

♂, 20 mm. Head, palpi, antennae, and thorax bright ferruginous-ochreous. Abdomen fuscous. Legs ferruginous, tibiae and tarsi irregularly banded with dull ochreous, posterior pair fuscous, whitish-ochreous beneath. Forewings rather broad; costa moderately arched, termen nearly straight; bright rufous-ferruginous, more or less irrorated throughout with dull ochreous-ferruginous spots; costa with five pairs ochreous-ferruginous spots, between base and posterior edge of median band; four more pairs on costa beyond, last one at apex more or less continued along termen and nearly reaching tornus; edges of basal patch and anterior edge of median patch hardly traceable, being merged into general markings, posterior edge of median patch irregularly waved, from costa at about three-fifths to tornus, followed throughout by a dull purplish-metallic line of slightly raised scales; beyond this are seven short black lines, transversely placed, lower three shortest, upper four enclosing spots of ferruginous and purplish-metallic respectively; a somewhat raised line of purplish-metallic scales, commencing from base of eighth costal pair of spots along termen to above tornus; a well-marked ochreous spot above middle of wing, just before posterior edge of median patch; a similar, much larger, but

suffused double spot on fold before middle; cilia ochreous-ferruginous, mixed with fuscous, and with a darker ferruginous basal line. Hindwings dark fuscous; cilia pale reddish, becoming fuscous from middle of termen to tornus, and with a darker sub-basal line.

Hab.—Queensland: Cairns district, three specimens from F. P. Dodd.

TINEINA.

OECOPHORIDAE.

Eulechria hemichrysa, n. sp.

♂, ♀; 23, 25 mm. Head, palpi, antennae, and thorax dark fuscous. Abdomen dull ochreous, more or less infuscated. Anterior and middle legs dark fuscous, posterior pair orange-yellow. Forewings elongate, moderate, costa gently arched, termen obliquely rounded; dark fuscous, with hardly traceable darker markings; two dots, placed obliquely, just beyond one-quarter, above fold; two similarly placed at posterior end of cell; three or four others scattered in disc, sometimes absent; a more or less interrupted blackish line along termen; cilia fuscous, with an obscure row of blackish points at base. Hindwings elongate-ovate, termen rounded; orange; a fine fuscous line on posterior edge of costa, continued around apex to near middle of termen; cilia dark fuscous. Very distinct by the orange hindwings.

Hab.—Queensland: Warra and Mackay, ten specimens, probably in October.

Trachypepla lasiocephala, n. sp.

♂, 14 mm. Head white. Palpi white, externally dark fuscous, with a broad white band at apex of first joint. Thorax white, anteriorly fuscous, patagia white. Antennae fuscous, annulated beneath with white. Abdomen silver-grey. Legs white, banded with fuscous, posterior pair grey-whitish. Forewings elongate, moderate, costa gently arched, termen obliquely rounded; dark fuscous, finely irrorated with grey-whitish and black; a large white, somewhat trapezoidal patch, extending from base to just beyond middle and occupying upper five-sixths of wing; a small black basal streak; a somewhat triangular-shaped patch on dorsum before tornus, reaching half across wing and surmounted by a small black dot; a small black dot immediately above this on costa; cilia white, mixed with some blackish scales. Hindwings and cilia pale fuscous.

Hab.—Queensland: Warra, in September, several specimens.

PLUTELLIDAE.

Sagalassa basichrysa, n. sp.

♂, 16 mm. Head, palpi, antennae, and thorax fleshy-brown. Abdomen dark fuscous, annulated with ochreous. Legs fuscous, annulated with ochreous. Forewings elongate, moderate, costa hardly arched, nearly straight, termen obliquely rounded; fleshy-white on basal half, rest of wing fleshy-brown, more or less finely irrorated with fuscous: a broad chocolate transverse band, edges straight, from middle of costa to dorsum just before middle, narrowest on costa; a narrow line of fleshy-white, parallel and immediately following; an irregular fuscous blotch on costa at three-quarters; a suffused inwardly oblique fuscous mark from tornus, reaching to above fold, upper portion blackish, and followed by two small flesh-coloured dots; a suffused fuscous patch along termen, obscurely separated from tornal patch by ground-colour, and containing a small dull ochreous spot near apex; cilia fuscous, with a blackish sub-basal line. Hindwings dark-fuscous; a moderately broad median transverse orange band, edges irregular, narrowed on termen: cilia dull orange. Underside of forewing with an orange transverse fascia, from beyond middle of costa, where it is narrowest, to fold, with a projection outwards in middle; an elongate orange streak along cell.

Hab.—Queensland: Kuranda, seven specimens from F. P. Dodd.

TINEIDAE.

Comodica dochmogramma, n. sp.

♂, 12 mm. Head whitish-fuscous. Palpi and thorax fuscous, palpi white internally. Antennae whitish. Abdomen fuscous-grey. Legs whitish, posterior pair faintly tinged with fuscous. Forewings elongate, apex pointed: whitish, with dull ochreous markings: a tolerably thick longitudinal streak, commencing at base of costa, continued along fold and ending at anal angle, posterior half beneath edged with fuscous; two very outwardly oblique costal streaks, first from just beyond one-third, somewhat suffused, hardly reaching longitudinal streak; second from three-fifths to anal angle, followed on upper edge by a fine parallel line; a well-marked blackish dot at apex; a thick irregular ochreous-fuscous dorsal streak, interrupted by four nearly equidistant spots of

ground-colour, which are edged anteriorly with short streaks of dark fuscous: an elongate streak of ground-colour at posterior extremity of dorsal streak; cilia whitish, faintly mixed with ochreous. Hindwings lanceolate; dark fuscous; cilia fuscous, with a whitish basal line.

Hab.—Queensland: Kuranda, three specimens from F. P. Dodd.

CHRYSONOMA (?) MACULIFERA, n. sp.

♂, 14 mm. Head and thorax white. Palpi white, basal joint with a fuscous subapical spot internally. Antennae whitish, obscurely annulated with fuscous, basal joint white. Abdomen whitish-grey. Legs grey. Forewings elongate, moderate, costa gently arched, termen oblique; white, minutely irrorated with fuscous, and with blackish markings; a dot on costa immediately beyond base; a second, obscure, on costa at one-quarter; a third, distinct, on costa at about three-fifths; a spot in disc, obliquely below last costal spot; sometimes a small spot on dorsum, close to base; an irregular, suffused row of obscure dots along termen and apical fourth of costa; cilia grey-whitish. Hindwings and cilia whitish-grey, cilia wth an ochreous basal lne.

Hab.—Queensland: Cairns district, three specimens from F. P. Dodd.

GELECHIADAE.

ARISTOTELIA HEMISARCA, n. sp.

♂, ♀; 16 mm. Head and palpi fleshy-white, basal joint of palpi beneath with obscure ochreous bands, terminal joint with black subapical ring. Antennae fuscous, annulated with white. Thorax fuscous, lighter anteriorly. Abdomen ochreous-grey. Legs pale ochreous-grey, all tibiae and tarsi banded with fuscous. Forewings narrow, elongate, apex acute: dull fuscous: markings obscure; a moderately broad outwardly oblique transverse whitish-ochreous fascia, from costa at one-sixth to dorsum at one-fifth, where it becomes confluent with a moderate ochreous-whitish dorsal streak, somewhat suffused, from near base to tornus; an obscurely-edged ochreous-whitish transverse fascia, from costa at five-sixths to tornus, separated from dorsal streak by a patch of ground-colour; four or five quadrate spots of ochreous-white on costa, between psterior edge of previous fascia and apex, separated by similar-sized spots of ground-colour; cilia greyish-ochreous, with fuscous basal and median lines. Hindwings elongate-ovate, apex acute: pale greyish; cilia whitish, tinged with ochreous.

Mr. Meyrick, to whom this and several other species included in this paper were submitted, expresses the opinion that this species partakes more of the American and European forms than Australian.

Hab.—New South Wales: Broken Hill, not uncommon in March and April.

Crocanthes trizona, n. sp.

♂, 10 mm. Head, palpi, antennae, and thorax pale yellowish-white, antennae annulated with fuscous. Abdomen and legs paler yellowish-white. Forewings pale yellowish-white, with fuscous markings: three narrow transverse fasciae, first two somewhat dot-like, first from costa at one-sixth, second from costa about one-third, both continued obscurely to dorsum; third slightly inwards curved, from costa at four-fifths to dorsum at four-fifths; a lunate mark, transversely placed, above middle, just before third fascia; cilia yellowish-white, terminal half ferruginous. Hindwings thinly scaled; greyish-white; cilia yellowish-white.

Hab.—Queensland: Cooktown and Kuranda, four specimens from Olive and Dodd.

COSMOPTERYGIDAE.

Cosmopteryx cuprea, n. sp.

♂, 8-10 mm. Head fuscous, face metallic-coppery. Thorax dark fuscous. Palpi and antennae fuscous. Abdomen dull coppery-fuscous. Legs dark fuscous, tibiae and tarsi obscurely ringed with whitish. Forewings very narrow, apex pointed; a black basal patch occupying one-third of wing, and containing several very fine longitudinal streaks of metallic-blue; median third of wing orange, anterior edge separated from basal patch by a moderate transverse fascia of golden metallic; a small golden-metallic dorsal spot, finely edged with black, just before tornus; ground-colour between this and termen blackish; a small golden-metallic costal spot at four-fifths; cilia blackish, with a few golden-metallic scales. Hindwings linear fuscous; cilia fuscous, paler on basal half.

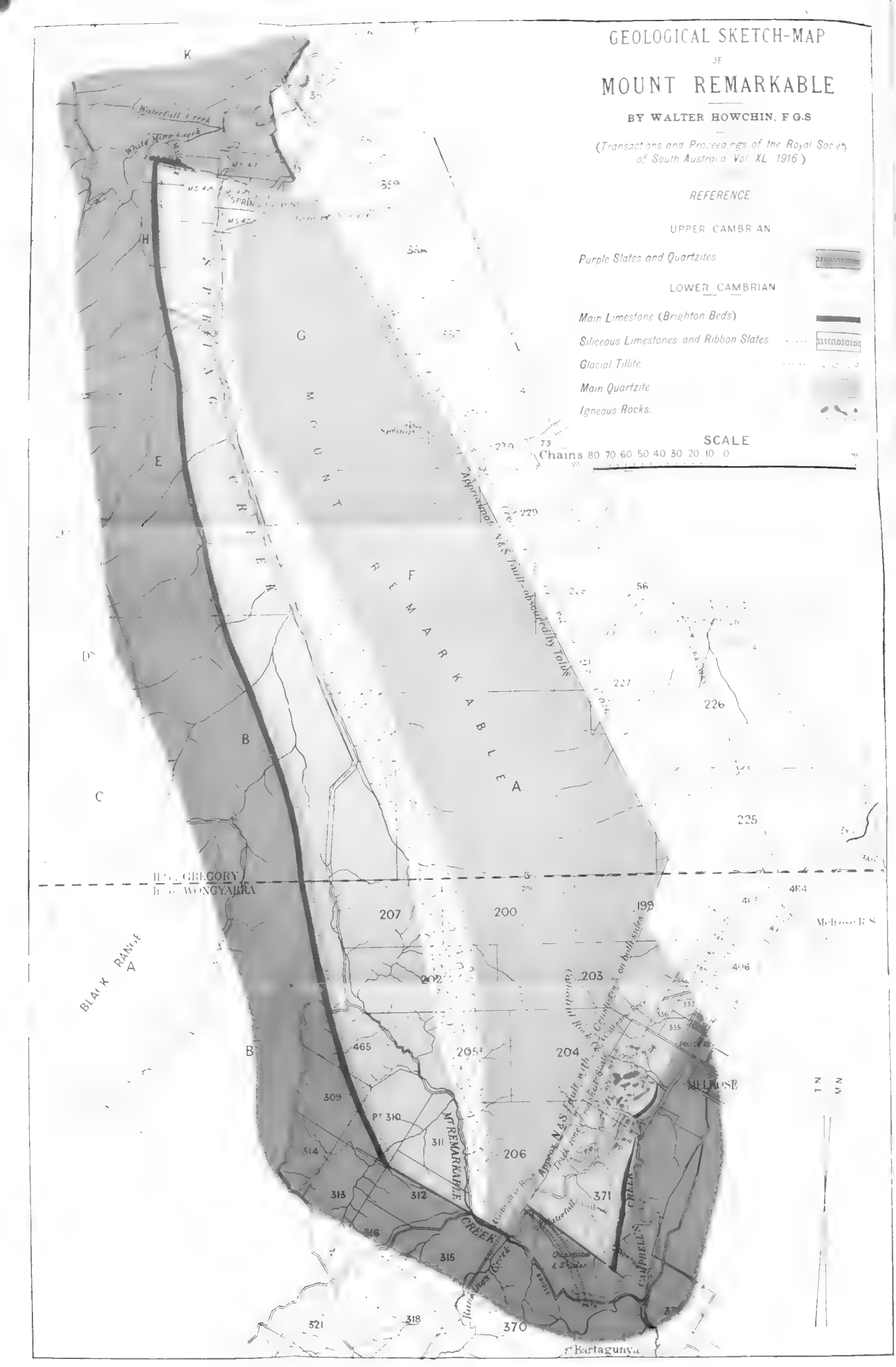
Hab.—Queensland: Kuranda, four specimens, taken in October, received from F. P. Dodd.

Cosmopteryx (?) cyanosticta, n. sp.

♂, 10 mm. Head, thorax, antennae, and abdomen black. Palpi fuscous, basal joint whitish beneath. Legs fuscous, posterior tibiae ringed obscurely with whitish.

Forewings elongate, apex pointed; black, with metallic-blue markings; a narrow line, from dorsum at one-third to middle of wing, curved inwards at extremity; a well-marked spot on costa in middle; a second, similar, just before apex, paler than last; two transverse spots, upper smaller, in middle of wing at two-thirds from base, almost midway between the two costal spots; a small spot on dorsum before anal angle; cilia fuscous, becoming black on basal half. Hindwings lanceolate; blackish; cilia blackish.

Hab.—Queensland: Cairns district, three specimens from F. P. Dodd.


GEOLOGICAL SKETCH-MAP
OF
MOUNT REMARKABLE
BY WALTER HOWCHIN, F.G.S
(Transactions and Proceedings of the Royal Society of South Australia Vol XL 1916)
REFERENCE
UPPER CAMBRIAN
Purple Slates and Quartzites
LOWER CAMBRIAN
Main Limestone (Brighton Beds)
Siliceous Limestones and Ribbon Slates
Glacial Tillite
Main Quartzite
Igneous Rocks.
SCALE
Chains 80 70 60 50 40 30 20 10 0
Waterfall Creek
White Mine Creek
MOUNT REMARKABLE
Approximate N&S fault-obscured by Talus
Hd. GREGORY
Hd. WONGYARRA
BLACK RANGE
Melrose R.S.
MELROSE
Mt REMARKABLE CREEK
CAMPBELL'S CREEK
Bartagunya
Quartzites & Shales
Approx. N&S fault with Crush-rock on both sides
Cathedral Rock
Gibraltar Rock
Rankines Creek
Waterfall
Bridle Path
T N
M N

The Geology of Mount Remarkable.

By Walter Howchin, F.G.S., Lecturer in Geology and Palaeontology, University of Adelaide.

With Petrographical Notes on the Basic Igneous Rocks of the Foot Hills of Mount Remarkable, by E. O. Thiele, D.Sc.

[Read September 14, 1916.]

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I.—Introduction.

The southern Flinders Ranges form a belt of highlands extending from Crystal Brook to Quorn, from which latter town they pass into the more extended hill-country of the northern Flinders Ranges. The southern Flinders, on their western side, exhibit a fault-scarp bordering the sunken area of the great rift-valley of South Australia; and on their eastern side are bordered by the Willochra plains, which also form a sunken area. Mount Remarkable, near Melrose, forms the most distinct and precipitous scarp on the eastern side of the ranges. The mount is eight and a half miles in length, has a height of 3,178 feet above sea-level, and rises 2,022 feet above the plain at its eastern foot. The view of the mount, as seen from the plains (pl. liv.. fig. 1), with its sudden rise and steep slopes, is very striking, and obtained for it from Eyre,[1] the explorer, in 1840, the appropriate name by which it has since been known.

The following geological notes are based on observations made during several visits to the locality. An area so extensive and so greatly disturbed would require many months of careful investigation for the mapping of its more detailed features, the time for which I have been unable to spare, but the larger geological features now presented are of such an interesting kind as to justify, I hope, the publication of the same.

Previous literature bearing on the subject is limited to Selwyn's Reports, published as a Parliamentary paper[2] in 1859. Selwyn ascended Mount Remarkable, observed "a small greenstone (hornblende and felspar) dyke on the east flank," and published a generalized geological section of the mount. In this section he shows a major unconformity as existing between the slates (which are represented as the fundamental series) and the quartzite—the latter having a much lower angle of dip and is represented as forming the cap of the range. Selwyn's hasty examination of the ground may account for his failing to recognize the true structure of the mount, while the great width of the quartzite outcrop might well deceive even a skilled observer in a cursory examination and be taken as evidence of an unconformable series. The slates, instead of being, as shown by Selwyn, older than the quartzite, are really newer and occupy a position stratigraphically superior to the latter; and, in the present

(1) Journal of Expeditions in Central and Southern Australia, vol. i., p. 44.

(2) Geological Notes of a Journey in South Australia from Cape Jervis to Mount Serle.

paper, another explanation is given for the abnormal width of the quartzite on the crest of the ridge.

II.—The Geological Succession.

A geological section taken across the ranges (in an east and west direction) on a line between Melrose and Spencer Gulf, exhibits a direct correspondence with the beds that outcrop near Adelaide. A typical example of the beds that are included in the Mount Remarkable section can be seen in their natural order (fig. 1) along a line drawn from the upper slates at Mitcham—across the tillite of the River Sturt—the limestones of the Brighton cement quarries—and the purple-slates and quartzites of the coast at Marino. Although widely separated in the localities mentioned, the beds in the respective areas exhibit the same order of occurrence and, lithologically, maintain a close resemblance to each other at their corresponding geological horizons. The chief interest in the case of the Mount Remarkable occurrences is in their tectonic features and the effects of earth movements, which have operated on a large scale.

Fig. 1.
Order of succession in beds near Adelaide; also at Mt. Remarkable.

A. LOWER CAMBRIAN.

1. Lowest (?) Beds Exposed.

The beds which comprise the main portions of the mount, as well as those on its western side, have a very constant dip to the west, while those which form the foot hills on its south-eastern side dip to the east. Between these respective areas of opposed inclination there is a zone of shattered and

kneaded rock, chiefly of a slaty character, the exact stratigraphical position of which is doubtful. As the main quartzite of the mount dips westerly the slates that appear immediately on its eastern side should be the equivalents of the slates that, in the neighbourhood of Adelaide, occupy the intermediate position between the quartzite that underlies the tillite on the one side, and the Mitcham and Glen Osmond quartzite on the other. This view is supported by the fact that in some cases noted the slates exhibited a closer lithological resemblance to the slates of that horizon than those which occur higher in the series. There is, however, a possibility that some of the broken-up slates may have been derived from the Tapley Hill series which follows, in a naturally descending order, the limestones that outcrop on the adjacent foot hills. The stratigraphical relationship of these broken-up slates to the main quartzite can be best seen in the section exposed in the Cathedral-rock Creek.

2. The Main Quartzite.

The backbone of the mount consists of quartzite, somewhat flaggy, and in places carries dark lines, apparently from the presence of granular, clastic ilmenite, the planes of deposition often showing current-bedding. The summit of the mount takes the form of a somewhat narrow ridge, from which it is sometimes possible to see the water of the Gulf on one side and the Willochra plains on the other. The mount, in its general outline, converges at both its northern and southern ends, and is widest in a transverse section passing through its highest point from east to west. A similar feature is shown by the quartzite outcrops, the latter being narrowed at either extremity but widening at the greatest transverse diameter of the mount, where they show a width across the strike of about a mile in horizontal measurement.

The strike of the beds is maintained more or less in the direction of the longer axis of the mount, and the dip, which is westerly, gradually increases in pitch across the strike from west to east.

In places the rock makes sheer faces of great height. At the northern end of the mount broken quartzite occupies most of the slopes, and on the north-western portion the road has been cut into the quartzite for a length of 69 yards. The stone carries fine-grained clastic felspar, with occasional dark lines on the bedding-planes, and dips W. 20° N. at 50°.

The "Cathedral rocks," situated about one mile and a half from Melrose, make a very bold feature on the eastern side of the mount. A sheer face of quartzite, about 200 feet in height, reaches to a shelf from which another pinnacle

rises for an additional 100 feet. Another perpendicular face of quartzite is seen on the opposite side of the creek, at a higher level, and from these respective sources very large screes are formed. The stone is slightly felspathoid and, in places, carries clastic ilmenite. From the crushed and highly-jointed condition of the stone the dip is somewhat obscure and variable, but several readings gave W. 20° S. at 70°.

At the southern end of the mount another peaked face of quartzite occurs, which is locally known as the "Gibraltar rock." It has a perpendicular height of about 200 feet, and forms part of the faulted face on that side. The stone is a medium-grained siliceous quartzite, carrying more or less clastic felspar in its constituents. Dip, S. 20° W. at 66°.

In only one instance, so far as known, does the Mount Remarkable Creek intersect the main quartzite of the mount. It is at the most westerly loop of the stream—the second loop from the southern end of the mount. At first sight the rock appears to have a low angle of dip, but on a close examination the chief divisional lines prove to be joint planes, and the true dip is got from the planes of sedimentation, which, though often obscure, was found in places to give the reading of N. 10° E. at 80°

Inasmuch as the quartzite passes beneath the tillite on the western flanks of the mount, it occupies a similar stratigraphical position to that of the flaggy and laminated quartzites that underlie the tillite in the neighbourhood of Adelaide, and on a question of natural sequence should be regarded as the equivalent of those beds. The abnormal thickening of the quartzite near the centre of the mount will be discussed later.

3. The Tillite.

The main quartzite of the ridge ends abruptly at the southern extremity of the mount in a sheer face of rock, 200 feet in height ("Gibraltar Rock")—as already described. A quarter of a mile further up the creek the Cambrian glacial beds, or tillite, make their appearance in the left bank, overlying the quartzite. The "spoor" of these beds was observed among the detrital material of the creek below Melrose, and was followed up stream till the parent rock was reached. The loose boulders of tillite bear a certain resemblance to the boulders derived from the brecciated rocks, but the matrices of the two kinds of rock are different; and further, while the crush-rocks are auto-clastic the tillite includes embedded stones of diverse origin.

These glacial beds are highly typical of the Cambrian tillite as seen in other parts of the State, but the included

erratics are relatively small, the largest observed being about 18 inches in length.

The most southerly outcrop of the beds is at the Mount Remarkable Creek, just below the junction of the roads on the southern boundary of Sec. 206. The tillite does not cross the creek to the southern side. The strike of the beds at this point is due north, and for about a mile, going up stream, the creek makes the dividing line between the tillite on its left bank and the Tapley Hill shales on its right. Within this distance the tillite makes some bold features in the outcrop, including two heavy ledges of rock that cause waterfalls and a conspicuous pinnacle of rock on the sky line.

On the southern boundary of Sec. 205 the Mount Creek makes a sharp turn to the west (going up stream), from which point the creek, instead of flowing along the boundary-line between the two sets of beds, has the Tapley Hill shales on both sides, while the tillite, with its northerly strike, follows a more easterly line along the higher slopes and passes over the watershed that separates the Mount Creek from the Spring Creek.

In passing over into Spring Creek the latter forms the dividing line between the tillite and the Tapley Hill shales for a distance of four and a half miles, when the tillite is cut out by a strike-fault at about a mile up stream from the Spring Creek copper mine. Looking up the valley from the northern extremity of the tillite there is seen to be a clear line of demarcation between the tillite and the underlying quartzite, marked by the vegetation of the respective areas; the former being well grassed, while the latter is almost bare of grass and carries low scrub. Notwithstanding the rise in the valley of the Spring Creek towards its head, the tillite rises along the flanks of the hill still more rapidly until, near its highest point, the middle slopes of the western side of the mount consist of this rock.

4. Ribbon Shale (Tapley Hill Series).

In the type district, near Adelaide, as well as in some other localities, the beds of this series have developed some measure of cleavage by which they split readily at a high angle to the bedding-plane and are commonly worked on the cleavage. At Mount Remarkable, and in most localities in the northern portions of the State, the corresponding beds have been subjected to less tangential pressure, and consequently have not developed slaty-cleavage, but split readily on the bedding-planes; they are, therefore, more appropriately classified as shales rather than slates.

The most extensive development of these beds in the neighbourhood occurs on the western side of Mount Remarkable, where they rest, for their greater length, on the glacial beds. They begin, in their most southerly outcrop, within the fork of the two roads, already referred to, and almost at the same place where the tillite begins in the Mount Creek above the Gibraltar Rock, and are bounded by the purple-slates-crush-rock on the one side and the tillite on the other. Northward of Sec. 311 they form the slopes on both sides of the main creek, and maintain a very uniform strike and dip over long distances (dip, W. 10° S. to S.W., at 50°-55°).

After crossing the watershed, between the Mount Creek and Spring Creek, they are bounded on the eastern side by Spring Creek and on the western side by the thick (Brighton) limestones, and continue northward beyond the limits of the mount. A good section of the beds can be seen up the "Waterfall" Creek, on the road that rises over the western ridges, about a mile up the valley from the Spring Creek mine. The beds here are very fissile on the bedding, and as jointing is also well developed the rock splits up into cuboidal masses. Above the waterfall the beds become more calcareous and massive, and finally pass into strong limestones.

Smaller areas of these beds are brought to the surface by faulting at the northern termination of the mount, and also on its south-eastern side. Further references to these beds will be found below in the paragraphs dealing with the tectonic features of the district.

5. The Limestones (Brighton Series).

The limestones follow in the series in the same order as in the type district, and with very similar lithological features. They show a gradual passage from the Tapley Hill shales, more or less calcareous in the lower members, to impure siliceous limestones, with "vermiculate" structure, in the middle members; passing up into relatively pure limestones (sometimes oolitic) in the highest beds.

(a) the limestones in the western outcrops.

The beds make a very regular outcrop on the western side of Mount Remarkable, not immediately connected with the mount itself, but they form a lateral ridge (or saddle) that is separated from the mount by the valleys of Spring Creek and the headwaters of Mount Remarkable Creek. They have been subjected, in places, to minor faulting and displacement, and vary as to the extent of spread in the outcrop, but in the case of the main limestone attain an average width of about two chains. The less pure and

siliceous limestones run parallel with the main limestone, on its eastern side, and cover considerably more ground.

Behind the house of Mr. William Gray (situated on Block B, immediately in front of Sec. 202) a cave occurs in the main limestone. The cave is easily accessible, and can be penetrated to a length of 27 yards, when the passage contracts and has not been explored further. The walls, roof, and floor of the cave are covered with a stalagmitic coating of a dull, dirty colour. The limestone in the neighbourhood makes a considerable spread and has a dip W. at 54°. At Mr. Mark Gray's hut, near the headwaters of Spring Creek, the limestone series forms a hill 200 feet in height, the stone varying in colour, being bluish, whitish, or pinkish at various zones. This belt of limestone forms a continuous outcrop in a north and south direction on the western side of Mount Remarkable for a distance of about eight miles. At its southern extremity it is cut off by a fault at the south-eastern angle of Sec. 310, and at its northern end it is also determined by a fault which intersects it in Mallee Creek (a tributary of the White Mine Creek), in Mining Section No. 1521. Throughout its course it is underlain by Tapley Hill shales and overlain by purple-slates and quartzites.

(b) THE LIMESTONES IN THE NORTHERN OUTCROPS.

The settlement of the beds at the northern end of the mount was accompanied by crustal adjustments which destroyed the continuity of the beds, produced repetition in their occurrence and threw the respective faulted segments into various angles with respect to each other.

1. The most westerly outcrop of the limestone in this area forms a fragment, about a quarter of a mile in length, that has been torn from the limestones in their regular north and south strike on the western side of the mount and placed at right angles to the same. The limestones follow a fairly direct course until they reach the Mallee Creek, in the upper part of which they are undisturbed and make a considerable exposure; but shortly before reaching the White Mine Creek (of which the Mallee Creek is a tributary) the beds are faulted and the severed portions have taken the form of the letter ⅂ in relation to each other. The faulted fragment has a due east and west strike, rising to the ridge overlooking the Spring Creek, and ends on the slopes facing the latter. It is remarkable how little disturbance has been caused in the surrounding beds by this important crust movement. The faulted limestone has a dip to the north and is overlain by thin-bedded shales and quartzites of the purple-slates series, which at a short distance from the plane of fracture have a

dip W. 20° N. at 43°. The underlying beds are obscured for some distance by cover, but within the fork of the two limbs of limestone the underlying slates show a dip W. 20° N. at 50°—these readings, both above and beneath the faulted limestone, being very much in accord with the general strike of the country. Near the fault-plane the limestone is somewhat altered, being metasomatized with the development of ferric oxide and sporadic crystals of pyrites, while the joint planes of the overlying quartzites are often coated by micaceous hematite. At the angle of disruption there is a little show of copper, mostly carbonate stains, and a little prospecting has been done (the White Mine), but without success.

2. The same limestones come to the surface again at a distance of something less than a mile to the eastward, being repeated by a strike-fault which cuts the beds obliquely. The outcrops follow a small valley that extends from the mine road to Spring Creek. On the mine road the outcrops are seen on the eastern side of the highest point where the lower and less-pure beds of limestone make the best show, crossing the road and entering the ground on the other side, where they are obscured by cover. Following down the small valley the main limestone is well developed on the left bank and the impure limestone on the right. Within about 200 yards before reaching Spring Creek the limestones are cut off against the purple-slates, but the main limestone reappears in the northern banks of Spring Creek, the limestone having been shifted out of the line of strike a little to the westward. The limestone in the creek is of good quality, pinkish in colour, about 20 feet in thickness, and has a dip W. at 50°. It is not seen in the southern bank of Spring Creek, and would not have been exposed at the surface but for the channel cut by the creek, the limestone being covered in the bank-face by the purple-slates. At a little distance along the line of strike (on the top of the northern bank of the creek) the limestone comes again to the surface for a short distance, making an exposure 21 yards wide, but is soon cut off again by the purple-slates. These features suggest that the repetitions, which follow a lineal course, have been caused by a strike fault, along the line of which the limestone rolls at or near the surface, making small isolated exposures.

3. The main limestone makes still another outcrop, a little further to the north-east, just below the junction of an important tributary that comes in from the west, having a course almost parallel with Spring Creek. The limestone, which outcrops on the left bank of Spring Creek about 100 feet to 150 feet above the level of the stream, runs nearly

parallel with the latter for a time, and then strikes a little north of east. This outcrop was traced over two small tributary streams and for a distance of about a third of a mile, but not quite so far as the main road, circumstances not permitting a further examination in that direction, but it is apparently obscured in that direction by surface wash.

4. The siliceous limestones, which occupy an horizon slightly lower than the main limestone, are once more developed in a wide outcrop over the foot hills on the opposite side of the creek to the main limestone just described. At their southern extremity these beds are indistinctly seen on the mine road. In their extension northwards from the road mentioned they occupy the western face of a ridge, forming craggy outcrops. They just touch the angle made by the Spring Creek about a quarter of a mile below where the isolated fragment of the main limestone (2) is seen in the creek, and then swing round to an easterly strike that brings them almost in a line parallel with the creek as well as with the main limestone on the opposite bank. Having reached the creek, they are almost immediately obscured by alluvial deposits that form successive and wide river terraces that blend with the plains. These siliceous limestones, here as elsewhere, exhibit differential weathering dependent on the varying proportions of calcium carbonate in the rock. Alternating lines of relief and depression give a striking characteristic to the stone, more particularly in that the laminae are much contorted, frequently making concentric outlines, in domes and basins, which in some cases measure up to six inches in diameter.

(c) THE LIMESTONES IN THE SOUTH-EASTERN OUTCROPS.

A third area of the limestone series forms the greater part of the foot hills of Mount Remarkable on its south-eastern side. The area forms a faulted segment of triangular shape. The apex of the triangle runs out against the eastern slopes of the mount, about a mile to the north of the township of Melrose. It is bounded, on its western side, by the talus of quartzite fragments of the lower slopes of the mount; on its eastward limits by Campbell Creek and the "Saddle Hill" (so named from its saddle-like outline), near Melrose; while the base of the triangle is formed by an east-west fault, which brings the purple-slates up against the truncated limestone series.

This is the most interesting, but at the same time the most difficult, field to map of all the limestone areas around the mount. It has been subjected to greater distortion than the other faulted segments, and has undergone not only much crushing, through physical strains, but the beds have been

intruded by a number of basic igneous dykes, which have still further complicated the geological outcrops. The zone of greatest disturbance follows the foot hills that are situated nearest to the mount; the outer, or eastern, portions of the area are less broken and disturbed than the inner.

The small creek that comes in from the west and joins the main creek at the south-western angle of Melrose marks a line of cross-faulting that is of stratigraphical importance. The creek referred to takes its rise near the summit of the mount, and in its course flows at the base of a particularly bold scarp of quartzite (the Cathedral Rock), and affords a useful geographical datum line for the purposes of description.

The Main or Top Limestone.

The Main Limestone in the south-eastern outcrops exhibits a very regular strike in an approximately north and south direction. Its northern extremity is on the southern bank of the Cathedral-rock Creek, not far from the latter's junction with the main creek. Here it thins out in a curve to the westward before reaching the creek mentioned, and is presumably cut off by the dip fault that runs in a line with the creek. In its southerly trend it follows, for about thirty chains, the western banks of the Mount Creek, forming a steep face about 200 feet above the creek level. It rises to form the crest of the hill in a steep scarp, facing the main creek just above the first bend that occurs in the stream above the Cathedral-rock Creek. The stone is a good pink-and-white limestone, having a dip E. 20° N. at 75°.

The main limestone comes down to the level of the Mount Creek (at a right angle), but is then cut off by the thin-bedded quartzites of the purple-slates series, which are faulted and have a slight shift to the west. The limestone reappears on the left bank of Campbell Creek, at a short distance from where it is faulted in the Mount Creek. The trend is now S. 10° W., and follows the left bank of Campbell Creek, the limestone forming a broad band on the ridge, and is strongly indented by the transverse streams that find their way into Campbell Creek. The outcrops widen as they near the southern extremity of the beds and attain a spread of over 100 yards. On the right bank of the principal tributary of Campbell Creek is a vertical cave in the limestone, known as the "Blowhole," but it has been but slightly explored. The limestone ends somewhat abruptly in descending the slope of a cross valley, a little to the northward of the bridle track that goes round the southern end of the mount, and is replaced by beds belonging to the purple-slates series.

The Siliceous Limestones.

These beds form here, as in other parts, a thick series that are more or less calcareous, but varying much in composition. Sometimes the silica is generally distributed throughout the limestone, while in other cases there are alternating lines and bands of calcareous and siliceous material. All the calcareous beds on the north side of the Cathedral-rock Creek appear to belong to this division. The area occupied by them gradually narrows in a northerly direction until, in about a mile from Melrose, the beds run out against the steep slopes of the mount, and the quartzites of the latter come down to the level of the plain, but the rock features at the base of the mount are obscured by a thick veil of talus.

The foot hills, immediately opposite to Melrose, form three moderately distinct ridges that run parallel with the mount and have a height of about 300 feet. These hills, in places, are connected with the mount by cross ridges or spurs. With the exception of the eastern slopes of the outer ridge (which consist of the purple-slates series) they are all included within the siliceous-limestone zone.

On account of the broken and disturbed condition of the rocks within this area it is almost impossible to trace connected outcrops along the strike, as many outcrops appear to be isolated and to possess very divergent lines of strike in relation to each other.

The most northerly extension of the calcareous beds observed was an outcrop of impure limestone in Sec. 339, over the fence, on the right hand side of the road, a little to the south-west of the refuse depôt. A little further to the southward slates are seen having a dip to the N.W. at 50° and a strike directed towards the mount.

Going southward—about in a line with the police station —on the western side of the first (most easterly) ridge, there are outcrops of brecciated rock, including a limestone with foreign fragments closely cemented in the mass and with veins of calcite. Slates on its western side dip S.W. at 70°. Lower down the same slope is an impure buff-coloured limestone, exposing a face 16 feet in thickness, with a dip S.W. at 43°. This bed is overlain by soft sand-rock, passing into siliceous and slaty fault-breccia; a similar rock forms a conspicuous ridge of outcrop in the valley a little further to the south.

On the top of the second (middle) ridge are outcrops of calcareous shale and a calcareous brecciated rock mixed with shaly material; dip, N. 20° W. at 83°. On the western slopes of this ridge there are further brecciated rocks, and

on a cross ridge, a little north of the last-named spot, is a dark-coloured slate; dip, due N. at 20°.

On the third ridge, separated from the base of the mountain by a small creek, are further brecciated rocks—some of which are siliceous—and on its western slope is a considerable fragment of a sheared limestone; dip, E. 20° S. This ridge communicates in one place with the side of the mount in the form of a spur, and consists of micaceous slate; dip, S. 15° W. at 72°.

In a position still further to the southward, and not far from the Cathedral-rock Creek, further outcrops of the siliceous limestones occur, the various outcrops showing discordant readings of dip and strike in relation to each other. On the spur, situated behind the Saddle Hill, there is a prominent ridge of broken limestone (spotted with micaceous hematite) and mylonitic grits, with a dip to the N.E. A little further to the southward is a still more prominent dyke-like outcrop of limestone, which ends abruptly on the north side of the Cathedral-rock Creek in a high pinnacle. The limestone, which is slightly mineralized and is penetrated by an old drive, has a dip E. 20° N. at 75°. A parallel outcrop of limestone, on the eastern side of the last described, runs out against the purple-slates of the Saddle Hill in an unconformity caused by faulting.

The beds on the southern side of the Cathedral-rock Creek are somewhat less broken in their outcrops than those on the northern side of that creek, and almost the whole ground between the Mount Creek and the base of the mount is occupied by the limestones together with several basic igneous dykes. The top (or main) limestone is situated nearest to the Mount Creek, as already described, while the siliceous limestones on its western side are exposed in numerous more or less parallel outcrops that continue almost up to the main quartzite of the mount.

The greatest thickness of the siliceous limestones in this cross section is on the western side of the calcareous zone nearest to the mount, where the outcrops are about 100 yards in width and show lineal and concentric weathering similar to the features present in the corresponding beds at the northern end of Mount Remarkable.

The siliceous limestones follow the general trend of the main limestone, on its western side, over the ridge into the next tributary creek, which finds its affluence with the main creek a little above the place where the main limestone crosses the latter. They then ascend to the rise on the eastern side of the Mount Creek, where they make a great

spread, and at the top of the hill they have a dip which is practically at 90°. Some mineralization has occurred in places (chiefly specular hematite), which has tempted the prospector to put in some exploratory work, and near the summit, in a particular zone of these limestones, a curious segregation of quartz has taken place, making hollow spheroids, giving the rock the appearance of a "pea-stone" or pisolitic structure.

While the main limestone maintains a moderately direct course to the southward, the underlying impure limestones describe a curve, following the right bank of the creek, and at a distance of half a mile higher up from their first crossing they recross the creek to its western side. In this latter case they strike the creek diagonally and make a striking feature in the bed of the stream, where the limestones exhibit some remarkable contortions and have weathered into irregular masses and outlines that make picturesque features. The erosive action of the stream is also well illustrated by deep gutters, smoothed surfaces, and pot-holes. One of the latter, with one of its sides worn away, is known locally as the "Armchair."

The limestones at this spot occupy the banks on both sides of the stream, but gradually curve round to the west, in a direction almost completely opposite to their strike in the first instance, and after rising on the back of a spur to the top of the ridge make a slight curvature to the south, where they are cut off by the main fault that separates the foot hills from the mount proper. The outermost line of outcrop of these limestones meets the creek at right angles, with a strike W. 20° N., dip northerly at 78°. This limestone was seen to cross the stream to the westward, but could not be recognized on the opposite bank.

B. UPPER CAMBRIAN.

Purple-slates Series.

The belt of limestones described in the preceding sections forms the upper limits of the Lower Cambrian Division of rocks. The beds that follow by sequence and in superposition possess, as a series, characteristic features, and are classed as Upper Cambrian. They consist of thick shales, numerous thin layers of quartzite, arenaceous limestones, and at some horizons develop thick, fine-grained quartzites that are usually subdivided by numerous bedding-planes. The beds possess a characteristic bluish or purplish colour, on which account they have been designated the purple-slates series. They are extensively developed in the region now

under description and form an outlying and investing circle of outcrops around Mount Remarkable.

(a) THE WESTERN OUTCROPS.

The hills on the western side of Spring Creek rise in a steep grade to the watershed of the Black Range. The geological section in this direction is comparatively simple: the Tapley Hill slates occupy the slopes next the creek, and are succeeded, in ascending order, by the siliceous limestones —the main limestone—and the purple-slates series. The latter follow a parallel strike with the limestones in a north and south direction. The lower members of the series consist mainly of slates and thin-bedded quartzites; but in the Black Range, which forms the greatest elevation on that side of Mount Remarkable and overlooks the littoral of Spencer Gulf, they pass up into strong and prominent quartzites, which make the main feature of the range.

(b) THE NORTHERN OUTCROPS.

The purple-slates series on the northern side of the mount has participated in the block-faulting that has so greatly disturbed the limestones and other underlying beds. The prevailing dip of the limestones is to the westward, but occasionally to the northward, and the purple-slates, which follow next in order, conform to the same general dip—either westerly or northerly, according to the pitch of the faulted segment to which they respectively belong, the prevailing direction being westerly.

In ascending Spring Creek from the Wilmington Road the purple slates make their first appearance immediately on the western side of the top or main limestone seen in the creek, about a mile up from the main road. Here the beds dip W. at 40° and follow the strike of the limestone southward to the road that crosses over to the Spring Creek mine. Higher up the creep, just above the weir of the Wilmington water supply, the purple slates are very characteristically developed, forming extensive dip slopes to the creek; dip, W. 10° N. at 40°.

The beds continue to occupy both sides of the creek, and can be followed up the White Mine Creek and the Waterfall Creek, which unite and form a junction with the Spring Creek at the position selected for the new reservoir. In the lower portion of the White Mine Creek bluish quartzites and siliceous slates make a feature, having a dip W. 10° N. at 48°. Higher up the creek characteristic purple-slates are more in evidence.

The presence of arenaceous limestones—or calcareous grits—can generally be noted among the lower members of the purple-slates series. They occur at Marino, near Brighton, at Hallett's Cove, and at Noarlunga; at the last-named place they are quarried for road metal. They occur over a somewhat wide outcrop on the White Mine Creek, just west of the position where the two faulted segments of limestone are opposed at a sharp angle and can be traced down to the creek, adjacent to and parallel with the north and south fence. They are also seen to the northward, across the Waterfall Creek, and on the top of the ridge, on the north side of this creek, and after passing through the east and west fence follow the slope of the bank into the next valley.

The faulted segment seen in the Spring Creek a little west of the Wilmington Road, gives a new direction to the beds. The throw which has brought the limestones into a position almost parallel with the creek has controlled the overlying beds in a like manner, so that the purple-slates have there a strike to the north-east. The latter continue to the northward, as the main surface features, for many miles, by Wilmington, Horrock Pass, etc. The road that passes from Wilmington through Horrock Pass to the coastal plains is in purple-slates throughout, exhibiting very fine rock scenery, and near the bottom of the pass precipitous hills of these slates rise 1,000 feet or more in height.

(c) THE PURPLE-SLATES AT THE SOUTHERN END OF THE MOUNT.

The southern end of Mount Remarkable is cut transversely by a powerful fault, which truncates all the beds coming in from the north, and is bounded on its southern side by the purple-slates series. The line of division made by the fault is very marked, and for some distance is coincident with the bed of the creek.

The approach to the southern end of the mount is by Bartagunya sheep-station house. Behind the house there is a rough surface of quartzite (dip, W. at 72°) with underlying purple-slates. Similar beds are exposed in the small creek close by the house (dip, W. 20° S. at 80°) and at a few hundred yards further down the creek is a strong ridge of whitish quartzite (dip, W. 10° S. at 55°). On the left-hand side of the path, rising to the saddle in going over into the Mount Creek, are some large blocks of a reddish slaty-limestone very characteristic of the purple-slate beds. Going down, on the other side of the saddle, the slates show a dip to the S.W., but at the bottom of the hill, near the gate, the dip is to the N.E., the beds being much broken and sheared as they near the fault-plane.

The purple-slates on the southern side of the fault exhibit extraordinary features of crush and are mylonized over a very wide area. The mash-rock[3] forms hills several hundreds of feet in height (especially in its extension westward), and can be traced southwards from the fault-plane for a considerable distance. A section across these mashed beds can be followed up Rankine Creek, and irregular and humpy outcrops occur in the bed of the Mount Creek, near the bottom of the path from Bartagunya.

(d) THE PURPLE-SLATES ON THE EASTERN SIDE OF THE MOUNT.

The purple-slates, with interbedded thin quartzites form the outer range of the foot hills at Melrose. On the left bank of the Mount Creek, behind the township, are two quarries that are worked for road metal, but the stone is of inferior quality for this purpose. In the upper quarry the stone consists of white to reddish, rotten felspathoid quartzite and arenaceous slates; while that of the lower is little more than a kaolinized slate. The beds dip E. at 88°. In both quarries the stone shows ripple-marks on the face of the bedding (a very common feature of the purple-slates in general), and in the lower quarry of the two they appear on almost every surface of bedding exposed. A well sunk at the side of the creek, between the two quarries mentioned, is in yellow, rotten slate, but has no great supply of water.

A little higher up the stream a transverse section of the slates can be seen in the banks where the beds dip easterly at 65°, and almost immediately above this outcrop is "Saddle Hill," which consists entirely of beds of this series. At the end of the hill, abutting on the Cathedral-rock Creek, the beds dip E. at 53°. These readings prove that the angle of dip increases as the beds approach the scarp face of the foot hills adjacent to the plain.

Continuing southwards, the purple-slates follow the eastern boundary of the main limestone, and extend in an easterly direction beyond the Survey road. On this road typical examples of these slates are exposed in a small quarry by the road side, about one mile south from Melrose. The slates in the quarry are very fissile and have a dip E. 10° S. at 50°. Purple-slates and quartzites can be recognized in the adjoining paddocks, showing a slightly higher angle of

[3] The term "mash-rock" is used with reference to the broken up slates, and "crush-rock" for the brecciated limestones and quartzites, the slates having been more finely broken up than the limestones and quartzites; but the difference in this respect has probably been determined by the relative hardness of the different rocks and their respective powers of resistance to the crushing force.

dip than that just mentioned. It is probable that these beds continue eastward and form much of the sunken area in that direction.

At the south-eastern portion of the foot hills of the mount the faulting has been somewhat complex and has led to the breaking up of the purple-slates series into large angular blocks. Three main fault-planes appear to be included in this system of fractures. One, having a strike north and south—parallel with the mount; another, with a strike east and west—transverse to the southern end of the mount; and a third, parallel to the last, but with a strike at right angles to the south-eastern slopes of the mount. By the last-mentioned fault the beds of the purple-slates series have been brought in, like a wedge, between the main quartzite of the mount on the one side, and the limestone series on the other. This fault apparently intersects the Mount Creek a little to the southward of the most westerly bend of the creek, where the latter cuts through the main quartzite, as described above. The evidences for this conclusion rest on the sudden change of outcrops from typical siliceous limestones on the one side, and equally typical slates and quartzites of the purple-slates series on the other, as described next below.

At the next bend to the eastward (up-stream from the great westerly bend) the creek cuts through a very strong purplish-coloured quartzite that dips S. 20° W. at 84°. This rock has at one time formed an imposing waterfall, as the stream now runs through a narrow gap, with precipitous walls 250 feet in height. The stream has almost done its work in this respect, having cut down the stony barrier at its up-stream limits to within a few feet of the normal grade, but there is still sufficient left to preserve the name of "the waterfall." This quartzite has all the features of the purple-slate series—its divergent strike, purple colour, black lines of sedimentation, and associated calcareous sandstones—leaving little doubt as to its true geological horizon.

The outcrop of this quartzite was followed along its eastward strike. It occupies the northern banks of a small valley that unites with the Mount Creek (just above the waterfall) and follows the ridge to the valley head, passes over the parting into the headwaters of the chief tributary that drains into Campbell Creek, over the next ridge, curving a little to the south, crosses another small creek to the southward, and intersects the bridle-path that goes to the south end of the mount. In its progress it splits up into several beds of quartzites, which are separated by slates. The beds, whilst not brecciated (as occurs in the case of the siliceous

limestones on their northern boundary), are in places much sheared, and exhibit evidences of great physical strain. It is this belt of country that to the eastward cuts off the main limestone at its most southerly limits.

Above the waterfall, at the next bend in the Mount Creek, there are typical purple-slates, followed by bluish and reddish quartzites, the latter sometimes coarse and gritty (dip, N. 25° W. at 75°); and at the sharp angle, where the creek comes round from the southern end of the mount, there are bluish and very siliceous slates (belonging to the same series), with a dip N. 10° W. at 80°. At this angle the purple-slates series is bounded on its western side by crushed slate, which separates the former from the main quartzite of the mount.

III.—Igneous Intrusions.

These, so far as observed, are limited to the south-eastern side of the mount, and are included within an area of about a mile long and half a mile wide. The outcrops appear as small disconnected pipes rather than dykes, and may represent small necks or fissure-vents of a multiplex volcanic centre. Considering the greatly-broken field in which they occur it is possible that their fragmentary character arises in part from fracture and displacement similar to that which has occurred with the associated sedimentary rocks.

With one or two exceptions, the igneous rocks are of a basic type, and exhibit (with some variations as to texture) a uniform character. All the outcrops have suffered more or less decomposition from weathering. Secondary developments of chlorite, uralite, and epidote are commonly present. Specular hematite, as well as micaceous hematite, frequently occurs in plates or nests, and sometimes in the form of feathery crystals on the face of the joints. Spheroidal weathering occurs, and in some cases the basic rock has become so rotten as to be easily crumbled to fragments by the fingers.

More than twenty of these volcanic necks or fragments were noted and mapped, and are briefly described below. The numbering refers to the figures on the map.

Group *(a)*—on the northern side of the Cathedral-rock Creek.

Nos. 1 and 2.—Two outcrops of a rock of gabbro type occur on the crest of the inner foot hills, on the northern side of the Cathedral-rock Creek. They probably form a single mass, but are separated in their outcrops by a small depression of grassy soil-cover that obscures their union. Unitedly they cover a surface of about 100 yards each way.

On its eastern side the igneous rock is bordered by a dark-coloured graphitic slate, which has been much broken, healed, and seamed along the lines of fracture. Nearby, this slate has been pushed out of the line of strike, from a north and south to an east and west direction. This igneous occurrence is the only one observed on the northern side of the Cathedral-rock Creek.

Group *(b)*—ON RIDGE AND SLOPES ON SOUTHERN SIDE OF THE CATHEDRAL-ROCK CREEK.

Nos. 3, 4, and 5.—The outcrops thus numbered bear certain relations to each other, and collectively form the largest development of igneous rock in the neighbourhood. It is an irregularly-shaped mass, occupying the summit and slopes of the ridge nearest to the mount on the southern side of the Cathedral-rock Creek. *No. 3* (forming the portion nearest the mount) is subcircular in outline and measures 90 yards by 80 yards. The limestones bordering the igneous mass appear to have been controlled by the latter, as they follow a circumlinear strike marginal to the igneous intrusion.

Following the top of the ridge, in an easterly direction, the impure limestones and calcareous slates occupy the ground for about 30 yards, and then another important outcrop of basic igneous rock is met with, forming a part of *No. 4*. At first sight *Nos. 3 and 4* might appear as independent outcrops, but on a closer examination it is seen that they are connected by a relatively narrow neck, just over the crest, on the southern side of the ridge. Near the summit of the ridge the *No. 4* dyke has a width of about 57 yards, but narrows as it passes down the slope on the south-western side and junctions with the *No. 3* outcrop. The calcareous beds which separate the two igneous intrusions at the summit of the ridge are squeezed into the form of a triangular wedge between the two arms of the igneous rock. As *No. 4* passes down the north-eastern slopes of the ridge it increases in width to 88 yards and makes a spur that ends on the terrace formed by the right bank of the creek.

The lithological features of this igneous zone *(Nos. 3 and 4)* are particularly interesting on account of the variation in the texture and form of the rock at different points. Near the periphery the rock is remarkably fine-grained and, to the naked eye, might be crypto-crystalline, while in the more central portions it is conspicuously crystalline and even gabbroid in its appearance. About two-thirds of the distance down the spur forming the *No. 4* outcrop there is a rounded knoll of porphyrite, which is enclosed in the very heart of the basic dyke. The porphyrite is rendered partially fissile by

the development of a system of smooth jointing, by which the rock splits up easily into rectangular pieces, causing the lower slopes of the spur to be strewn with its fragments.

In the area surrounding this remarkable porphyritic development the basic dyke has to some extent an amygdaloidal structure. Numerous gas cavities occur in the rock, of various sizes up to half an inch in diameter. Some of these have an elongated outline, suggestive of flow, and many of the cavities have received a secondary deposit, and are now filled by aggregates of small crystals of rhombohedral calcite. It is difficult to account for such a scoriaceous feature in the rock if formed at depth.

The dyke, resuming its normal features, follows the slope of the spur below the porphyritic inclusion, cuts through an impure limestone, and ceases to be visible on reaching a grassed terrace about 12 feet above the level of the stream. There is, however, an outcrop of igneous rock seen in the cliff face of the creek, not much out of line with the dyke just described. This is marked on the map as *No. 5*, and is probably an extension of dyke *No. 4*. The exposure is about 18 feet in width, but as the rock is much decomposed it is difficult to define its exact limits. This is the only instance in which an igneous rock was observed to be cut by the Cathedral-rock Creek, and even in this case it did not appear to occur on the opposite bank.

No. 6.—This dyke is also seen on the before-mentioned ridge, a little east of *Nos. 3 and 4*, from which it is separated by a zone of calcareous and slaty rocks, about 80 yards in width. The dyke goes over to the southern face of the ridge for a distance of from 60 yards to 70 yards, having a strike W. 20° S. On the northern side of the ridge a strike is maintained almost parallel with that of the adjoining *No. 4* dyke. It is in this igneous intrusion that the old Mount Remarkable Copper Mine [4] is situated. At the mine costeen pits have been cut into the dyke, and at a lower level a tunnel has been driven into it for about 50 feet in length. In the section thus exposed the dyke is seen to be greatly broken and mashed under pressure, sometimes even reduced to a crush-rock composed of angular, recemented fragments. It is in this broken rock that the copper (in the form of green carbonate) occurs. A shaft, said to be 20 feet in depth, has been sunk in the contact rock, and from the dumps at the surface it is seen to be in laminated and banded shales belonging to the Tapley Hill-Brighton series. These shales have been indurated and heightened in colour by igneous

[4] See Records of Mines of South Australia (official), 4 ed., 1908, p. 94.

action, with secondary developments of specular hematite, chlorite, etc.

No. 7.—This is a round knoll of basic igneous rock, on a small rise situated on the north-eastern side of the old mine, and is probably continuous with another outcrop of a similar kind on the next ridge on the eastern side. The two outcrops are separated by a small intervening valley, mantled by rain-wash.

No. 8.—On the eastern face of the ridge last-mentioned there is an outcrop of a siliceous igneous rock which makes a peculiar and isolated feature among the surrounding basic dykes. The rock is aplitic in character, very acid, and forms a lenticle, 30 feet in length, margined on all sides by sedimentary rocks. There is probably another outcrop of a similar kind in a small valley just below the old copper mine, as two or three surface stones were met with there of an aplitic type, but these contained a little more felspar in their composition than in the other case, and also a few small sporadic crystals of schorl; it was not seen *in situ*.

No. 9.—On the next spur, in an easterly direction, there occurs the most prominent outcrop of igneous rock in the locality. It is situated about 60 yards eastward of the aplite vein, and forms a dyke-like ridge of rock that rises about three feet above the normal level. It is of limited extent, much fractured under weathering, and is bounded on all sides by limestones and calcareous shales.

No. 10.—Situated at about 70 yards in an E.N.E. direction from the aplite vein *(No. 8)* is another basic dyke. It is even with the surface of the ground and occupies the slope of a spur towards the Cathedral-rock Creek.

No. 11.—This igneous outcrop forms a knoll on the top of the ridge, and is situated in a direction S.S.E. from outcrop *No. 9*. It is not far distant from the western edge of the main (Brighton) limestone, from which it is separated by a zone of slaty rock that has been somewhat changed by the igneous contact. The ridge, which follows the right bank of Cathedral-rock Creek, forms an angle with a still higher ridge that faces into the Mount Remarkable Creek. The igneous outcrop now under description occurs at the angle of these two ridges, and has a strike N.E. and S.W. It possesses some anomalous features. In the first instance (at its north-eastern end), it has the features commonly presented by the basic dykes of the neighbourhood, but as it rises to the crest of the higher ridge it passes into a peculiar rock of a somewhat acid type. A marked feature at the surface is the presence of numerous empty spaces, giving the rock a honeycomb appearance. It contains some quartz, with phenocrysts

of felspar somewhat sparingly developed, and the presence of limonite, partly filling some of the cavities in the stone, may point to these spaces having been originally filled with iron pyrites. The dyke, which does not follow the direction of the main limestone or associated beds, is about 200 yards in length and ends abruptly at the crest of the higher ridge, where it is cut off by slates. There is a certain similarity between this dyke and the porphyritic development in *No. 4*, but the intrusion now under description has, apparently, undergone greater alteration.

Group *(c)*—IN CREEK NEXT ABOVE CATHEDRAL-ROCK CREEK.

No. 12.—This exposure occurs a little to the westward of the last described *(No. 11)* and about 200 yards to the south-east of the dyke *(No. 6)* at the old mine. The ridge on which most of the igneous dykes so far described occur forms the watershed between the Cathedral-rock Creek and another creek next above it. The present outcrop is situated a little over the ridge on its southern side. It appears to be approximately circular in outline, and is indicated by a large number of broken rocks on the surface. It extends for about one-third of the distance down the slope towards the creek next above the Cathedral-rock Creek. There appears to be a small dyke on the western side of the one just referred to, as a number of dyke stones were noticed in the line of a small depression on the slope of the hill, but they were mixed with other rock fragments and their source could not be definitely located.

No. 13.—There is a small exposure of a basic dyke at the mouth of the last-named creek where it unites with the main stream a little above the spot where the main limestone crosses the Mount Creek. The dyke occupies the left bank of the stream and runs parallel with the same for a short distance, but does not appear to be very thick.

No. 14.—About 100 yards up the same creek a strong exposure of an igneous dyke is seen on both sides of the creek. It has a strike S. 20° W., is about 40 yards wide, and can be traced along the line of outcrop for about 80 yards.

No. 15.—A little higher up the creek than the last-named another dyke makes a prominent feature on the right bank of the stream. It forms a circular knoll that immediately attracts attention. The texture of the rock varies from medium-grain to coarsely-crystalline.

No. 16.—On the right bank of the same creek, near its confluence with the Mount Creek, surface stones indicate the outcrop of another basic dyke. It is situated at the back of

a rather prominent outcrop of impure limestone, at a height of about 40 feet above the Mount Creek.

No. 17.—On the same slope, facing to the Mount Creek, slightly further up the creek than the conspicuous pillar of crush-rock on the side of the hill, is another basic outcrop. The igneous rock passes up the slope from the river flat to a height of about 50 feet above the stream, and is about 40 feet in width.

No. 18.—This is the furthest-south outcrop of the dykes in the igneous field. It is situated about a third of a mile higher up the Mount Creek than the last-described occurrence and on the same side of the stream. It has intruded the siliceous limestones, which are here strongly developed and have undergone extraordinary crush. The dyke is indicated chiefly by surface stones, one of which is two feet in diameter. It appears to have but a limited extension.

Group *(d)*—ON THE EASTERN SIDE OF THE MOUNT REMARKABLE CREEK.

No. 19.—An inconspicuous outcrop occurs on the eastern side of the Mount Creek, a little southward of the great spur of the main limestone, where it comes down to the creek level. A few igneous rocks are seen *in situ* in the bank, on a small piece of road-cutting, about 20 feet above the level of the stream, and loose stones can be traced up the rise for about 20 yards or 30 yards. It lies on the western side of the main limestone, but not in contact with that rock.

No. 20.—Exposed by a few surface stones and an obscure outcrop on the slope facing to Campbell Creek.

No. 21.—A broadish ridge separates Campbell Creek and the next creek on the right bank of the Mount Creek. A basic dyke outcrops on this ridge, near the centre and about half-way up from the Mount Creek, in a direction south-westerly from *No. 20.* It is in the form of a patch, and nearby the rock is much veined by hematite, which has led to some prospecting for minerals.

IV.—Tectonic Structure.

Mount Remarkable forms a great wedge-shaped mass of intimately-jointed quartzite which, although of great width, is almost destitute of massive outcrops. The summit and slopes of the mount are littered with countless fragments of angular rocks. The eastern side is particularly steep, giving rise to scores of screes, or shoots of loose stones, which in many cases extend from the summit to the base of the mount. The whole mountain is undergoing rapid waste by the breaking up of the rock on the joint-planes, and then by the loose

material gravitating to the bottom. An impressive illustration of this process will be seen by a walk up the Cathedral-rock Creek to a position above the rock mentioned.

Such abnormal conditions, occurring in the case of a hard rock with an extensive outcrop, suggest that earth movements must have been particularly active and powerful in bringing about such a result. This view is supported by certain attendant phenomena, by which it may be possible to infer the more important movements that have given outline to this truly "remarkable" mount.

1. The Great (?) Meridional Fault of the Range.

The quartzite not only occupies the crest of the range from end to end, but forms the greater part of the material of which the mount is composed. The western side has a more gradual slope than the eastern, probably arising from the fact of its forming the dip slope of the beds, the dip varying from 65° in the lower situations to about 85° on the eastern side of the summit.

When this consistently-high reading of dip is compared with the great width of outcrop of these beds (reaching, as already stated, at their maximum, a mile, at least, in horizontal measurement), it must be inferred that a duplication of outcrop has occurred that has greatly increased the surface spread of the stone and given a fictitious appearance as to its true width.

What has happened to produce this remarkable thickening of the quartzite forming the axis of the mount is not at all clear. Various tectonic movements, under certain conditions, might lead to such a result, as, for example, in the following cases:—

(a) An *unconformity*, with the quartzite (as the upper series) forming a cap, with the beds inclined at a low angle, as shown by Selwyn *(loc. cit.)*. But Selwyn's geological section of the mount is entirely in error; there is no unconformable series, there are no underlying slates (as shown by Selwyn), and the quartzite, instead of dipping at a low angle (as shown by Selwyn), dips at a high angle and is interbedded with the other beds of the section.

(b) A *double monoclinal-fold*, or "hogback," with faulting in the septum curves on each side of the upthrow, and the arch worn down to the level of the resisting quartzite, might give a great breadth to the latter bed; but this explanation is not

relevant to the case in hand, inasmuch as the uniform high angle of dip proves that the mount forms no part of a monoclinal-fold.

(c) A *close-fold in an isoclinal series*, in which the quartzite formed the central axis of the fold and thereby became duplicated, would give double breadth to the bed and a high angle of dip. Such a scheme of tectonic structure does not, however, fit in with the surrounding features, as there is little folding throughout the district, other than a uniform pitch to the west on the western and northern sides, and to the east on the eastern side of the hill.

(d) Pressure in a north and south direction on beds at a high angle might cause a vertical puckering, with overlapping and thickening of the beds near the centre. In the Mucra Ranges, near the Mucra Springs, due east from Mount Remarkable and two and a half miles west of the Black Rock railway station, there are some very striking quartzite outcrops that have been, under great pressure, turned at right angles to the strike. While such an occurrence is a possible explanation of the thickening of the quartzite at Mount Remarkable, no corroborative evidences were obtained that this was the case there.

(e) In looking for an explanation it must be remembered that the tectonic control of the region concerned has been one of fracture, displacement, and readjustment of the dissevered component parts. It is, perhaps, most consistent with the surrounding tectonic features to assume the existence of a trough-fault (or several of these) with parallel walls, by which segments of the quartzite were successively dropped to lower levels, as shown in fig. 2. The broken character of the quartzite obscures the structure within its own area, but the features pertaining to the outcrops are strongly suggestive of a major line of fracture that follows the crest of the ridge and has had the effect of duplicating the beds. This view is supported by the high dip of the beds on the eastern side of the summit, the great spread of the quartzite outcrops, and the shattered condition of the stone.

A doubt still remains as to the particular quartzite which forms the core of the mount. As already intimated, if the orderly succession seen on the western side of the

mount (extending from the purple-slates to the tillite) be continued downwards to the underlying bed, then the quartzite which occupies that position must be regarded as synchronous with the quartzites that underlie the tillite near Adelaide. But at several points in the outcrops of the Mount Remarkable quartzite the stone includes clastic ilmenite, occurring in dark lines, and is current-bedded. In the case of one stone picked up near the Cathedral Rock, the ilmenite forms at least one-fourth of the mass. The only horizon where such current-laid ilmenite is known to occur in the Lower Cambrian of South Australia is in the basal beds of the series, where it is a constant and very characteristic feature. The difficulty in the way of referring the Mount

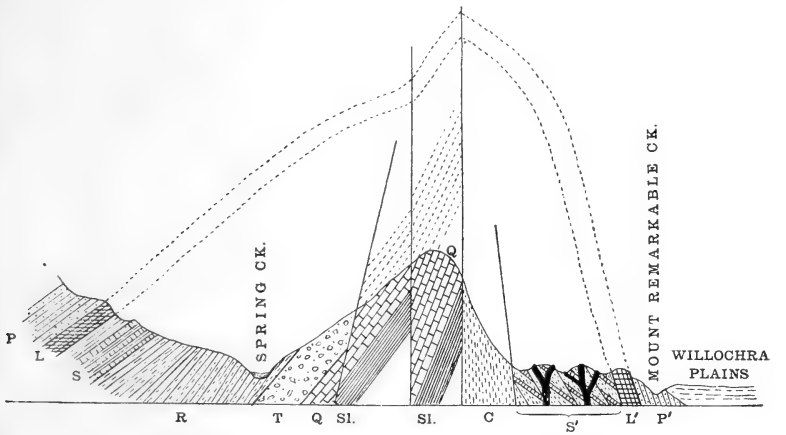

Fig. 2.

Geological Sketch-section through Mount Remarkable to show probable duplication of the main quartzite by faulting. P.P'. Purple-slates Series. L.L'. Main (Brighton) Limestone. S.S'. Siliceous Limestones. R. Ribbon (Tapley Hill) Slates. T. Tillite. Q. Quartzites. Sl. Slates. C. Crush-rock. The dotted lines show the extension of the beds over the mount before faulting took place.

Remarkable quartzite to the same horizon is very great, as the tillite, which rests on the quartzite of the mount, is from 8,000 feet to 10,000 feet (perhaps more) above the horizon of the ilmenite grits of the basal beds. If a stratigraphical accordance can be established between the respective ilmenite-bearing beds, then it might be found that quartzites of very different geological horizons have united to form the main axis of the mount.

2. The Great Western Fault.

The main fault on the western side of Mount Remarkable appears to be coincident with the bed of the Spring Creek, extending from the headwaters of the latter to the Spring Creek mine, and possibly further north. Spring Creek pursues a remarkably straight course. When standing on its watershed and looking down the valley, it has the appearance of an artificial ditch. It has no projecting spurs and scarcely a curve in its course (see map)—a physical feature that is strongly suggestive of a line of faulting. It is true that the bed of the creek follows the junction of dissimilar rocks along their line of strike, but this is scarcely sufficient to explain its remarkable straightness for a distance of five miles. Definite evidence of an important fault on this line is obtained by the gradual narrowing of the tillite outcrop and its final disappearance before reaching the northern end of the mount. The tillite is here cut out by a strike-fault, and the Tapley Hill shales are brought into direct juxtaposition with the quartzite, making a strong stratigraphical unconformity.

It is possible that this fault-plane is continued southward beyond the limits of the Spring Creek Valley. The Mount Remarkable Creek runs for the distance of a mile in a straight course on the dividing line between the Tapley Hill slates and the tillite (precisely similar to the course of the Spring Creek), and the tillite narrows into almost nothing in its southern extremity, where it abuts upon and ends at the transverse fault at the southern end of the mount—features which are similar to its disappearance by faulting at its northern extremity.

3. The Great East and West Fault at the Northern End of the Mount.

The main fault at the northern end of the mount (which appears to possess a strike a little north of west) truncates the quartzite of the main ridge, for the latter cannot be seen north of that line, and its place is taken by beds that are higher in the series. Notwithstanding the magnitude of this displacement the immediate zone of fracture cannot be seen on account of the great spread of quartzite talus that encumbers the northern slopes of the mount and even encroaches upon the road, and thereby hides from view the immediate fault-plane. The main road that crosses the end of the mount is very near the fault, and in some of the small cuttings on the road there are evidences of stratigraphical disturbance that show its close proximity.

After passing the highest point on the road (immediately to the west of the main limestone outcrop) the purple-slates

appear, and can be traced on the descent towards the creek, having a dip W. at 45°. At the most southerly bend in the road the slates are reversed, dipping north-easterly, and are very broken and rotten, with a confused dip. At about half-distance from the crest of the road down to the creek the main quartzite shows a scarp face and is cut by the road. At the western end of the scarp there is a strike-fault, which hades westerly at 70°, with the quartzite on the one side and purple-slates and thinnish quartzites (having a dip conformable to that of the fault-plane) on the other. Then the talus once more hides the beds, but at the spur of the hill, near the bottom of the road, there are again outcrops of rotten slates, which dip north-westerly at 30°. At the base of the hill, near the old smelting works, almost at creek level, the slates dip W. 20° N. at 63°. After crossing Spring Creek the fault intersects the limestones on the opposite banks, the beds being bent to a sharp angle and made to take the strike of the fault-plane.

The Spring Creek Copper Mine is situated near the north-western angle of the mount. The ground in which the mine is worked forms a rough, irregular, ferruginous outcrop, making a scar on the face of the hill in bold crags, fifty yards wide. Judging from stone at surface, the ore consists mainly of red oxide and green and blue carbonates, set in a broken fault-rock, which seems to be a mixture of Tapley Hill slates and purple-slates. It is probable that the mineral deposits occur in the broken country at the intersection of the main north and south fractures with the main east and west fractures (in a multiplex system), which would account for the two dissimilar shale beds being mixed together in the lode-stuff.

While the east and west fracture at the north end of the mount is the main tectonic feature on that side, the gravitational adjustments that followed on the collapse of the area gave rise to several north and south fractures in the direction of the general strike. This is made evident by the repetitions of the limestone outcrops, as already described. It is probable that this area is extensively faulted in this way, but it is only when a well-defined bed comes into contact with the fault-plane that the effects can be observed. The map shows three such lines of fracture:—

(a) On the western side of Spring Creek, where the limestone (faulted to the east) is cut off by the purple-slates series.

(b) About a mile to the eastward of the above, in the small creek the head of which is on the mine road

and which joins the Spring Creek, where the main limestone is exposed in the northern banks.

(c) A few hundred yards further to the eastward of the last, where the siliceous limestones are repeated at the next turn of the creek to the northward; the creek, in this stretch of its course, following apparently the line of the fault. Stratigraphical evidence of the fault-plane is seen at the turn of the creek just mentioned, where on the left bank of the stream the Tapley Hill slates dip W. at 35°, while the siliceous limestones (much distorted) on the opposite bank dip a few points north of west at 55°.

The fact that each of the limestone outcrops on this side of the mount is turned back upon itself and bent in an eastward direction suggests that the least resistance existed on that side. On the western side there was the great buttress of the quartzites of the Black Range, and to the northward the equally thick and compact purple-slates, which also failed to yield to pressure, while the more extensive and important subsidences of the eastern area (which formed the eastern plains) allowed the gravitating segments to find extension in that direction. The exigencies of the case doubled back the beds against the normal strike, but the pressure could not have been severe, as the beds do not pass into the anticlinal and synclinal folds, but maintain, on the whole, a comparatively uniform dip to the west; while crush-rock, which is such a marked feature of the disturbed field on the south-eastern side of the mount, is apparently absent in the north. In some instances, however, as in the case of the siliceous limestones that abut against the north-eastern angle of the mount, the grain of the stone is much flexured.

4. Tectonic Features of the Eastern Side of the Mount.

The mount is not exactly equilateral. The greatest transverse diameter is along a line that intercepts the highest point of the mount, and is situated about two miles to the northward of Melrose. The great fault-plane that determines the eastern face of the mount is angulated at about the same spot. There are probably two fault-planes, which intersect at an obtuse angle, the one trending south-westerly and the other in a north-westerly direction. The latter follows the base of the north-eastern face of the mount where the main quartzite comes down to the plain, but the exact line of fault is obscured by a wide talus, composed chiefly of quartzite fragments, which forms a gentle slope, extending

from the lower slopes of the mount, easterly, to the public road, a distance of about a mile, and having a fall of about 100 feet. A number of springs, in lineal order, follow the base of the mount, and probably indicate the junction between the quartzite and the sunken purple-slates of the plain.

The fault which defines the south-eastern side of the mount divides the mount proper from the foot hills, and at its southern end is cut by the transverse fault that truncates the south end of the mount. The great scarp of the Cathedral Rock, 300 feet in height (made in two sections), as well as other prominent scarp faces of quartzite, probably represents the line of fracture. The Cathedral-rock Creek also marks the line of a transverse fault, which is evident from the discontinuity of the beds on either side of it.

The two principal faults just described, together with the plains on the eastern side of the mount, mark off a triangular area of foot hills that include features of great geological interest. The stratigraphical succession of the beds within this area has already been described. They are identical with those met with on the western and northern side of the mount, but the tectonic phenomena seen in this segment are unique. The main limestone is but little disturbed, and follows a definite strike (although interrupted at the Mount Creek) till cut off by the transverse fault, but all the beds between it and the quartzite of the mount (belonging to the siliceous limestones and ribbon-slate series) have been subjected, not simply to distortion, but disruption to an extreme degree.

The belt of rocks adjacent to the base of the mount, and in places far up the side, is composed of crushed and triturated rock that has become recemented in irregular masses that are now quite destitute of bedding planes. An outcrop of this kind, consisting of mashed material in large dark-coloured rock masses, at a height of 600 feet from the base, can be easily recognized from the township of Melrose, and is known locally as the "Cat Rocks." (See pl. liv., fig. 2.)

The zone of crush-rock includes the two inner ridges of the foot hills (opposite Melrose), while set in the mass of mashed material are larger dissociated fragments of the original rocks outcropping at various angles, but still retaining to some extent their natural bedding planes. These are no doubt fragments that have been torn from the parent mass by the earth-creep, and are now mixed up indiscriminately with the more brecciated portions, which accounts for the incongruities that occur in their respective strike and dip.

Sections of the mash-rock can be seen in the creek a little below the Cathedral Rock.

The crush-rock crosses the Mount Creek a little above the main limestone, where very massive blocks of triturated siliceous limestones occur on the banks, and continue up the rise on the opposite side. The same rock features extend higher up the creek on both sides, the greater crush having occurred within the curve made by the siliceous limestones in their return strike to the mount, and are in evidence almost to the extreme southern end of the range, covering an area of about two and a half miles in a north and south direction, and one mile on the east and west diameter.

In this area, as in the northern, there are evidences of on extensive field of fracture, which makes geological mapping, except after prolonged and detailed work in the field, extremely difficult. The longitudinal fault which exists on the south-eastern side of the mount is not so much a single line of displacement, but a wide zone that is filled by mashed rocks derived chiefly from slates. This fault zone narrows as it approaches the southern end of the mount, and becomes reduced to a disturbed area a few feet in width, impregnated with iron oxides. Between this zone of mashed rock, near to the base of the mount, and the main limestone that runs parallel with Campbell Creek, there is an extensive area of the earthy and siliceous limestones and slates which, while preserving the form of stratification, is for the most part, in the condition of a crush-breccia. The strike of the beds is very divergent at different points, producing a corresponding variation in the direction of dip. The main limestone which outcrops on the eastern side of this disturbed area is not materially affected in the same way, although it is to some extent shattered along its western borders.

An important transverse fault can be recognized where the siliceous-limestone series abut against the purple-slates series just below the waterfall in the Mount Creek, mentioned above. Although this fault makes a feature on the eastern side of the mount, it stands related to the great east and west fault at the southern end of the mount, and will be referred to under that heading.

5. The Great Fault at the Southern End of the Mount.

At the southern end of the mount we meet with another of the major faults that has helped to determine the outline of the main ridge. The fault-plane has a strike 35° N. of W., which cuts off the limestone series on both sides of the mount, as well as the glacial till, in addition to the quartzite

which forms the main axis of the mount. The truncated quartzite makes a sheer scarp of about 300 feet (known as the Gibraltar Rock), and a little further to the west the till forms a pyramidal hill of about the same height. The fault follows the bed of the creek from the bifurcation of the road (in Sec. 312) downstream to the sharp bend where the creek turns to the northward along the eastern side of the mount. The mount is on the upthrow side, and the purple-slate series on the right bank of the creek forms the outcrop on the downthrow side.

Bartagunya station house, situated about a mile from the south end of Mount Remarkable, is on the purple-slate series. Behind the house there is a rough surface of quartzite (dip, W. at 72°) with purple-slates beneath. Below the house the slates dip W. 20° S. at 80°. In the small creek, further down from the house, there is a strong ridge of whitish quartzite (dip, W. 10° S. at 55°). A block or two of reddish limestone occur on the left-hand side of the path going up the hill from the house towards Mount Remarkable Creek. On the saddle of the hill, going over into horse-gully on the way to the creek, the strata are disturbed (dip, E. 12° S.). Going down the hill to the Mount Creek slates show dip slopes nearly parallel with the gully (dip, S.W.). Near the bottom of the path the dip varies from N. 20° W. to N.E. The beds are here within the area of the fault zone, the slates are greatly mashed, and in places show very defined shear-planes, which are made conspicuous by differential composition and bands of colour. Large irregular masses of mash-rock occupy the bed of the main stream just below the Gibraltar Rock, and similar outcrops are seen on either side of Rankine Creek for a considerable distance upstream. Following up the main creek above the Gibraltar Rock, the mash-rock forms hills on the southern side of the creek several hundreds of feet in height.

At the south-eastern angle of the mount, a little east of the Gibraltar Rock, the main north and south fault intersects the main east and west fault. In the angle produced by this intersection is included a segment of the purple-slates series which, as a faulted block, extends northwards for about a third of a mile, and throughout that length is in juxtaposition with the quartzites of the eastern portion of the mount. The relationship of this faulted block to the surrounding areas shows an important hiatus in the geological order of succession on two sides—on the northern boundary the main limestone is faulted out, and on the western side, bordering the mount, the main limestone, silicous limestones, Tapley Hill slates, and tillite are missing.

V.—Summary and Conclusions.

The leading geological features in the region that has been dealt with in this paper may be summarized as follows:—

1. Mount Remarkable owes its prominent and isolated form to two circumstances:—(1) The hardness and great extent of its quartzitic core, and (2) the position and magnitude of its faults.

2. While numerous minor faults are indicated, the principal fractures can be referred to four main systems of displacement, which are, broadly, coincident with the four sides of the mountain—two being lateral and one at either extremity of the mount.

3. The main axis of the mount consists of the oldest rocks exposed, while the mount is surrounded by a ring of purple-slates and associated thin quartzites, which represent the newest and, stratigraphically, the highest members of the series.

4. The greatest displacements have taken place on its southern and eastern sides. Considering the thickness of the strata in the downthrow areas, the mount at one time must have been more than twice as high as it is at present. A meridional fracture split the mount in two, when the eastern half dropped from between 2,000 feet to 4,000 feet in vertical height. The northern and southern segments, under the influence of gravitational adjustments, also dropped to a like extent at either end of the mount. The movements of subsidence were gradual and extended over a lengthened period.

5. In the process of settlement of the disturbed areas there ensued differential strains, complex fractures, and general crush that shattered the rocks and recemented the fragments by welding them into a confused mass. These effects are on a very large scale on the south-eastern and southern sides of the mount, and to a less extent on the northern side also.

6. The subsiding segments at the northern end of the mount had greatest freedom of movement to the eastward, which permitted strike-faulting and a repetition of the beds, but the very thick and compact purple-slates extending far to the northward formed an unyielding massif, which compelled the faulted limestones to curve back against the strike. The limestones of the south-eastern face were nipped as in a vice—no repetition of beds was possible—they were mostly crushed to fragments and, as in the case of the northern segments, were forced back in a reverse direction to the normal strike.

7. The structure of Mount Remarkable, when considered as a whole (possessing, as it does, a hard core or backbone surrounded on all sides by sunken areas consisting of newer sediments), supplies a very fine example of a mountain *horst*.

8. The tectonic movements that gave Mount Remarkable its peculiar features were not limited to that particular area or produced isolated effects. A continental movement (epeirogenic) first gave a general elevation to the land, which, after reaching a maximum altitude, broke up into regional blocks, which respectively became fissured, tilted, and in places separated from each other by areas of greater subsidence. In this way the present physical outlines of South Australia took shape. By the subsidence of the rift-valleys along the lines of the great gulfs the southern Flinders Ranges became scarped to the west; and by the subsidence of a great earth-block that has formed the Willochra plains to the eastward, Mount Remarkable has been scarped to the east. The geological history of Mount Remarkable is, therefore, only one among many episodes of a like kind in a wider field, where the tectonic forces have operated in shaping the hills and valleys of our land.

9. The geological age in which Mount Remarkable took its present form cannot have been very remote. The crush that was incidental to the great subsidence came later than the period that witnessed the intrusion of igneous dykes, for the latter were caught in the same mill that pounded the sediments that these dykes had penetrated. The absence of quartz veins from the crush-rock also indicates superficial movements, and proves that there were no deep-seated fractures or welling-up of silicated waters that would otherwise have filled up the interstitial spaces caused by the crush. There is little doubt that the southern Flinders Ranges, of which Mount Remarkable forms a part, were elevated as part of the great plateau-forming movements that occurred some time during the later Cainozoic age, and formed the first stage in the development of the southern highlands of South Australia. The fractures and block-faulting that followed broke up the peneplain into platforms, scarps, and rift-valleys, among which Mount Remarkable took its place.

10. The plains on the eastern side of Mount Remarkable form the watershed of the Willochra Creek, which carries the main drainage of the district and flows northward. On most of the low rises between the mount and Booleroo Centre, and even further, there are highly-siliceous consolidated river sands and gravels which have no relation to the existing channels. Wells sunk on the plains prove the existence of alluvium to considerable depths. Thick consolidated gravels

also flank the outer foot hills of Mount Remarkable opposite Melrose, and attain a height of 200 feet above the plain. This extensive alluviation exists on a present-day watershed. Such an anomaly is explained by cognate evidences which prove the former existence of great waterways coming down from the north, and which found their outlet by the valley now occupied by Gulf St. Vincent. The Willochra Creek occupies the bed of this dead river, but instead of flowing south, as of old, it flows in the opposite direction and empties its waters into Lake Torrens.

In one of my visits to Mount Remarkable I had the pleasure of being accompanied by my colleague, Dr. E. O. Thiele, who has kindly undertaken to describe the igneous rocks that occur on the foot hills of the south-eastern portions of the mount, and these descriptions will form an appendix to the present paper.

The difficulties of mapping the geological features have been considerable on account of the very imperfect and erroneous outlines of the "Hundred" maps covering the region examined. This difficulty was in part met by the courteous assistance of the Surveyor-General (Mr. E. M. Smith, I.S.O.), who kindly placed at my disposal the latest results of the new survey of such portions of the ground that were being subdivided by the Government for repatriation purposes. I have also to acknowledge the kind assistance of the Geological Survey Department for valuable aid in preparing the map for publication.

DESCRIPTION OF PLATES.

Plate LIII.

Geological Sketch-map of Mount Remarkable and the Foot Hills of the mount.

Plate LIV.

Fig. 1. Photographic view of Mount Remarkable taken from the eastern plains at a distance of four miles from the mount.

Fig. 2. Photographic view of the "Cat Rocks," opposite Melrose, at a height of about 600 feet from the base of the mount. These rocks form an irregular outcrop of mashed slates.

VI.—Appendix.

Petrographical Notes on the Igneous Rocks of Mount Remarkable.

By E. O. Thiele, D.Sc.

The following observations are the result of the petrological examination of a series of igneous rocks occurring in the foothills of Mount Remarkable, near the township of

Melrose. The general field occurrence of these rocks has been described by Mr. Howchin, with whom I had the pleasure of spending several days mapping in their relationships to the surrounding rocks.

The igneous rocks fall into three groups:—(1) Altered Dolerites; (2) Quartz Porphyrites (including Quartz-ceratophyre); (3) Aplites.

1. Dolerites.

The rocks of this group are the most abundant, occurring in a number of small isolated patches within a relatively restricted area, as will be seen from Mr. Howchin's map. They vary considerably in texture, from a coarse-grained type, approaching a gabbro, to compact examples of a basaltic character. Both microscopically and in thin section they very closely resemble the basic rocks of Blinman, which have been described in an earlier volume of this Society's Transactions by W. N. Benson.[1]

Slide No. 1.—Altered Dolerite.

Macroscopic Characters.—This example is a medium-grained holocrystalline rock, with a prevailing greenish-grey colour. Ferromagnesian minerals are dominant and the structure is granular.

Microscopic Features.—Considerable mineral rearrangement has taken place, but in general a definite ophitic structure is recognizable, though as a rule the breaking-up of the original minerals has developed a granular character. The ferromagnesian minerals are the most abundant, and the unaltered forms are chiefly pyroxene, but uralitization has proceeded to some extent. A little granular material of high relief is probably olivine.

The felspars, where definitely determinable, are triclinic, giving extinction angles on the albite twin lamellae up to 25°, representing probably labradorite. They generally show considerable alteration, passing into epidote and calcite. Iron oxides are present, but are not very abundant.

Slide No. 2.—Altered Basaltic Type.

This example is a fine-grained, compact rock of a greenish-grey colour.

Under the microscope this section shows abundant long, slender, felspar laths, set in a fine-grained devitrified base, crowded with magnetite showing good cubic and octahedral

[1] "The Basic Rocks of Blinman, South Australia, with Notes on Associated or Allied Rocks," W. N. Benson, B.Sc., Trans. and Proc. Roy. Soc. S. Aus., vol. xxxiii.

outlines. Much of the interstitial material is chloritic, and in general the rock is considerably altered, but appears to represent a rapidly-chilled rock, and may, therefore, be a dyke.

Slide No. 3.—Altered Gabbroid-Dolerite.

This is a medium-grained, holocrystalline rock, with abundant green ferromagnesian and lighter-coloured interstitial material, somewhat altered, chiefly felspar.

The thin section shows a holocrystalline and ophitic structure. The ferromagnesian minerals are abundant, with some prismatic outlines, but generally the secondary molecular rearrangement has resulted in a confused, granular, and fibrous intergrowth. Much of the original pyroxene has passed over into uralite. Olivine is present, but not abundant. The felspars are, generally, much altered, and in habit are rather long prisms. From the extinction angles they would appear to be probably labradorite.

2. Acid Porphyritic Rocks.

These, in general, are pinkish-brown porphyritic rocks, showing abundant phenocrysts of felspar and some quartz. One occurrence of note shows this rock as intruding the dolerite. There is some variation in the character and appearance of this rock in the several outcrops noted; some of the extreme examples presenting rather nondescript features as hand specimens. Thin sections, however, show that this is due to the introduction of a considerable amount of calcite by percolating solutions from the surrounding impure limestones. This has led to a varying amount of metasomatic replacement. The less altered examples, in thin sections, show a well-developed porphyritic structure, in which the prevailing phenocrysts are triclinic felspar, with quartz in minor amount. The extinction angles, measured in favourable sections, range up to about 16°, which, together with the chemical evidence, indicates a fairly pure albite. Ferromagnesian minerals are rare. There is a little chlorite, pseudomorphic after biotite, and, in one section, there is a little muscovite. The base is typically micrographic, with some spherulitic patches. Calcite occurs in a varying amount in most of the slides examined. Some examples show it arranged along cracks, which have served as lines of percolation, and others indicate, in the relic structure still recognizable, that the action has been metasomatic.

One sample, which was practically free from calcite, was chosen for chemical analysis, and the result is interesting in that it indicates a soda-rich type which compares very closely

in composition with a quartz-ceratophyre from the Noyang district of Gippsland. The Victorian rock was formerly described, by the late Dr. A. W. Howitt, as a quartz-porphyrite, but later referred to by Professor Skeats as a quartz-ceratophyre. (2)

Analyses of some of the Gippsland ceratophyres are given for comparison.

3. Aplites.

It would be interesting to have the analysis of the aplite also, for it appears probable that the latter may be genetically related to the ceratophyre; but I have so far been unable to find time for this work.

The prevailing felspar in the aplite is a microcline, and the question is raised as to whether it is the normal potash type or the soda variety, anorthoclase.

	A	B	C	D
SiO_2	76·26	77·66	78·77	72·41
Al_2O_3	12·40	12·30	12·44	14·38
Fe_2O_3	1·64	0·61	0·95	2·94
FeO	2·60	0·17	—	0·85
MgO	trace	0·73	0·02	1·18
CaO	0·28	0·16	0·53	0·87
Na_2O	6·27	6·96	6·79	6·86
K_2O	·41	0·19	0·24	0·13
H_2O-	·12	0·46	0·26	0·04
H_2O+	·02			0·67
P_2O_5	trace	trace	—	0·17
MnO	—	—	—	0·09
TiO_2	0·50	—	—	0·26
Total	100·50	99·24	100·00	100·85
Sp. Grav. ...	2·59			2·63

A—Spec. No. 13. Quartz-Ceratophyre, Cathedral-rock Creek, Mount Remarkable. Anal., E. O. Thiele.

B—Quartz-Mica-Porphyrite (Quartz-Ceratophyre), Navigation Creek, Gippsland. A. W. Howitt.

C—Quartz-Porphyrite (Quartz-Ceratophyre), Mount Elizabeth Creek, Gippsland. A. W. Howitt.

D—Quartz-Ceratophyre, Nowa Nowa district, Gippsland. E. O. Thiele.

(2) "The Volcanic Rocks of Victoria," Prof. E. W. Skeats, D.Sc., A.A.A.S., Brisbane, 1909.

ABSTRACT OF PROCEEDINGS

OF THE

Royal Society of South Australia

(Incorporated)

FOR 1915-1916.

ORDINARY MEETING, NOVEMBER 11, 1915.

THE PRESIDENT (J. C. Verco, M.D., F.R.C.S.) in the chair.

THE PRESIDENT welcomed Mr. G. G. Mayo (Fellow) on his return from a lengthened stay in England.

REPRESENTATIVE GOVERNOR.—Letter received from the Board of the Public Library, Museum, and Art Gallery of South Australia, acknowledging advice that Mr. Walter Howchin, F.G.S., had been reappointed as Representative Governor on the Board.

KANGAROO ISLAND RESERVE.—Letter received from the Secretary to the Hon. Commissioner of Crown Lands, stating that, in view of the alleged destruction of fauna on Kangaroo Island, the inspectors had been instructed to enquire and report on the same.

BOTANIC GARDENS.—Dr. PULLEINE moved, Mr. S. DIXON seconded, a resolution embodying certain suggestions for making the Botanic Garden of greater economic value to the State. After discussion it was moved by Professor RENNIE, seconded by Mr. E. ASHBY, and resolved, "That the Society approves generally of the tenor of the proposed resolution, and that the same be referred to a Committee consisting of the President, Dr. Pulleine, Mr. S. Dixon, and Professor Osborn, with power to modify the resolution as they may deem advisable before the same is forwarded to the Hon. Commissioner of Crown Lands."

BY-LAW. SECTION III. PAPERS.—The HON. SECRETARY reported that the Council had repealed the existing By-law and substituted the following:—

1. No paper which has not been previously approved by the Council shall be laid before the Society.

2. Every paper laid before the Society shall be immediately delivered to the Secretary.

3. The Council shall, at its next or a subsequent meeting, decide whether such paper shall be published.

4. If the Council decide to publish the same, in whole or in part, it and all copyrights thereof shall become the property of the Society, such copyrights to include all plates, maps, diagrams, and photographs that are reproduced in illustration of the same; and all blocks used in such reproduction shall be the property of the Society; but original drawings and negatives of photographs shall remain the property of the author.

5. If the Council decide not to publish a paper, either in whole or in part, the same shall be returned to the author, if he so desire.

6. All papers and other contributions published by the Society shall be subjected to editing by an Editor appointed by the Council.

7. The author of any paper published by the Society shall be entitled to receive free of cost 25 copies of the same, and to obtain additional copies, not exceeding 75 (unless the Council shall determine otherwise) upon paying the extra cost thereof. Every such copy shall include a statement that it is extracted from the publications of the Society.

8. All communications intended for publication by the Society shall be clearly written on one side of the paper only, and in fit condition for being placed in the hands of the printer.

9. Before printing any paper a proof shall be submitted to the author, who shall be allowed to make any slight amendments without cost; but considerable alterations must be paid for by him.

10. In order to ensure a correct newspaper report, it is advisable that all papers and other communications laid before the Society be accompanied by a short abstract.

The suggestions of the Council for enforcing this By-law are as follow:—

(A) That a copy of this By-law be sent to each author with the following statement for signature:—

"I have read the By-law, Section III., Papers, and agree to the conditions contained therein in respect to all papers and contributions herewith submitted [and hereafter

to be submitted] by me to the Royal Society of South Australia (Incorporated).

"Signature .....

"Date .....

"NOTE.—If the author so desire, he may strike out the words in [brackets]."

(B) That the copy of the By-law sent to each author be accompanied by such suggestions as the Editor may consider necessary for the preparation of manuscripts in such manner as to ensure uniformity of style when printed.

The By-law and suggestions were unanimously approved.

EXHIBITS.—Mr. E. ASHBY exhibited the following birds collected on November 1:—*Hallornis (Malurus) cyanotus*, Gould, the White-winged Wren, breeding, but with only a few blue feathers, from St. Kilda, South Australia. Also a pair from Leigh Creek for comparison. *Geobasileus hedleyi rosinae*, Mathews, the allied Buff-rumped Tit, from the samphire flats, St. Kilda, S.A. *Sericornis maculata osculans*, Gould, the allied Scrub Wren, from the same locality. Also a very rare epiphyte orchid, collected in the Richmond Ranges, Northern New South Wales, three years ago. The flower spray, about $3\frac{1}{2}$ inches across and 8 inches long, contained 15 flowers. The locality had not been known, and the plant had been described from the flower only by Bentham as *Sarcochilus divitiflorus*.

PAPER.—"The Woworra Tribe of North-western Australia, with Grammar and Vocabulary," by J. R. B. LOVE; communicated by Edwin Ashby, M.B.O.U.

ORDINARY MEETING, APRIL 13, 1916.

THE PRESIDENT (J. C. Verco, M.D., F.R.C.S.) in the chair.

THE PRESIDENT referred to the death of the Right Honourable Sir Samuel J. Way, Chief Justice. He was a member of the Adelaide Philosophical Society, to which he was elected in 1859, and so became a Fellow of the Royal Society of South Australia when, twenty years later, the former was changed into the latter. He occupied the position of President from October, 1880, to October, 1882, and for nearly fifty-seven years he gave us the countenance of his membership and the financial help of his subscriptions,

and for several recent years he had the honour of being the earliest member on our register. In consequence of Sir Samuel's regretted death the distinction of *doyen* of the Royal Society of South Australia now rests upon Mr. Walter Rutt. He was elected to the earlier society in 1869, ten years after Sir Samuel Way. He was for many years our Honorary Treasurer, and when he relinquished that responsible office it was only to take up the heavier and more onerous duties of Honorary Secretary, and every Fellow and every Member of the Council will agree that a more capable, reliable, methodical, and punctual officer could not be desired. He well merited the distinction he holds as our venerated *doyen*. Might he live to wear and enjoy it for many years. Another of our earlier members who had passed away merited more than a formal notice. Mr. Robert Barr Smith was elected to the Adelaide Philosophical Society in 1871, and dying in 1915 held his membership for forty-four years. He had justified his election, shown his practical and sustained interest in our Society, and perpetuated his memory by bequeathing to us the munificent sum of £1,000. This, added to two previous similar donations from other gentlemen, raised our endowment fund to £3,000, thus providing a yearly income sufficient to meet present modest clerical expenses and to pay in part for the binding of the voluminous yearly acquisitions to our valuable library. We felt grateful to our departed Fellow for his timely and appropriate benefaction. The absence of his name from our register brought next to Mr. Rutt's that of our honoured member, Mr. G. G. Mayo. He also had proved himself a true friend to the Society. For many years as Honorary Secretary he held office prior to Mr. Rutt, and we all remember his geniality and desire to oblige us in every possible way; we congratulated him, therefore, as *proxime accessit*.

The President also referred to the distinction which had been conferred on one of our Honorary Fellows (Professor Bragg) and on his son. Since our last session they had received the Nobel prize in recognition of their valuable scientific researches and discoveries in connection with the X rays and radio-activity. Nor could we overlook the decoration of Sir Douglas Mawson with the Helen Culver Medal of the Geographical Society of Chicago for his achievements as leader of the Australasian Antarctic Expedition. We had hoped to see the scientific results of that visit to the

Polar regions published as a set of special Memoirs of our Society; but circumstances seemed adverse, and they would probably appear as a work unassociated with any particular institution. But in whatever form they might be made known to the scientific world, and preserved to posterity, we should look forward with great interest to their completion and publication. He could not refrain from making a few remarks about our last volume of Transactions and Proceedings, the largest the Society had ever issued, with nearly 900 pages of printed matter and 70 plates, besides many figures in the text. Several papers were purely technical, of considerable length, and necessarily of interest only to those studying the same departments of science; but they represented an immense amount of industry and research, were of incalculable value, and would be consulted as long as science endured. There were others of considerable interest to general readers, such as those on the expedition to the Everard and Musgrave Ranges, and the ethnology of one part of New Guinea, enlivened and explained by numerous accompanying photographs. Altogether we might be gratified with the production of the past year, and would hope to have a similar volume, as large and as interesting, to distribute at the end of 1916.

The Hon. Secretary reported that the first grant in aid of scientific research, in accordance with the circular issued in 1913, had been made by the Council to Mr. G. H. Hardy, of the Tasmanian Museum, for investigations into the Flight of Birds.

The President reported that the Committee appointed on November 11, 1915, to deal with the resolution with regard to the management of the Botanic Garden had decided that the time was not then quite opportune for taking action. Later on the question was raised again in the Council, who decided that some suggestions laid before them should be supported, and a letter to that effect was forwarded to the Hon. Commissioner of Crown Lands.

Nominations.—William Ray, M.B., B.Sc., Victoria Square, and H. Lipson Hancock, Manager of Wallaroo and Moonta Mining and Smelting Company, Moonta Mines, were nominated as Fellows.

Exhibits.—Mr. Edwin Ashby, M.B.O.U., exhibited the following bird skins collected in the mallee, near

Karoonda, South Australia, on November 25, 1915:— *Gilbertornis rufogularis* (Eastern Red-throated Thick-head), *Campbellornis superciliosus* (White-browed Wood Swallow), *Drymodes brunneopygia* (Scrub Robin), *Oreoica cristata clelandi* (Southern Crested Bell Bird), *Hylacola cauta* (Rufous-rumped Ground Wren), *Acanthiza pusilla hamiltoni* (Red-rumped Tit), *Smicrornis brevirostris viridescens* (Greenish Tree-Tit), *Pardalotus punctatus xanthopygius* (Yellow-rumped Pardalote), *Leggeornis lamberti assimilis* (Purple-backed Wren), *Epthianura albifrons* (White-fronted Chat), *Gliciphila melanops chandleri* (Tawny-crowned Honey-eater), *Gliciphila albifrons incerta* (Eastern White-fronted Honey-eater), *Lichenostomus cratitius howei* (Victorian Wattled-cheeked Honey-eater). Also to compare with above:— *Amytornis striatus* (Striated Grass Wren), from same district, *(Pachycephala) Gilbertornis gilberti*, from Mannum; also from Cape York, Queensland, Dr. MacGillivray's new parrot, in which the male has a red face and bright-blue crown, the rest of the plumage bright-green, and the female has a brown crown and face, the rest of the plumage similar to the male. He also showed a growing plant of the fern *Aspidium unitum*, var. *propinquum*, referred to in his paper of May 13, 1915. Professor Chapman showed a flat bar of steel, on the edge of which a series of crosses had been marked with a punch. The edge had then been filed down until the marks were removed, and then polished. The bar had then been strained in tension beyond the elastic limit, when the marks had become clearly visible, being raised slightly above the surface. A small round bar, similarly treated, but overstrained by compression, showed similar results, the resuscitated marks in this case being slightly depressed. A plain polished bar of mild steel broken under tension had developed two series of lines at right angles to each other, showing the effect of the distortion of the crystals. Mr. Edgar R. Waite showed proofs of the maps and plates illustrating his description of fishes, which would form Part I. of the published Scientific Results of the Australasian Antarctic Expedition. Mr. A. M. Lea showed the fruiting stems and seeds of four kinds of *Kentia* palms; also fruit of *Pandanus;* also lemon seeds which had sprouted inside the fruit—all from Lord Howe Island; also nest of trap-door spider from a tree fern on Norfolk Island; and a very large Egyptian scorpion. Captain S. A.

White showed two skins of the Arctic Skua *(Stercorarius parasiticus)*, the first known to be taken in South Australian waters, although they are often seen by steamers passing down the Gulf; also skin of the Southern Rufous Bristle Bird *(Maccoyornis broadbenti whitei)*, which inhabits the low bush and rushes of Younghusband Peninsula.

Paper.—"Note on the Occurrence and Method of Formation of the Resin (Yacca Gum) in *Xanthorrhoea quadrangulata*," by Professor T. G. B. Osborn, M.Sc.

Ordinary Meeting, May 11, 1916.

The President (J. C. Verco, M.D., F.R.C.S.) in the chair.

The President introduced Mr. Thiele, M.Sc., who was acting as Lecturer on Mineralogy and Petrology in the University of Adelaide during the absence of Sir Douglas Mawson.

Nomination.—W. Champion Hackett, seedsman, Rundle Street, as Fellow.

Elections.—H. Lipson Hancock, mine manager, Moonta Mines, and William Ray, M.B., B.Sc., Fellows.

Exhibits.—Mr. Edwin Ashby exhibited birds, nest, and eggs of the Mistletoe Bird; the nest was in the form of a bag of material resembling woven cloth, with opening on one side, and handle passing over the bough from which it hung. Captain S. A. White showed a White-breasted Cormorant *(Hypoleucus fuscescens)* from Little Althorpe Island; also two Pied Cormorants *(Hypoleucus varius hypoleucus)*, one in breeding, the other in non-breeding plumage, both females, one from the Coorong, the other from the mangroves north of Port Adelaide; also two tubes of parasitic worms, one from a cormorant's stomach, the other from the thick coating of fat covering its abdomen; also eight rounded stones, one of granite and seven of sandstone, and shells of four species of molluscs from a cormorant's stomach, doubtless swallowed to aid digestion. Mr. A. M. Lea exhibited a drawer of weevils of the genus *Leptops*, many of which attack wattle trees, and a few of which have become very destructive to apple trees and vines in South Australia, Victoria, and New South Wales, through the larvae boring into the roots.

Papers.—"Australian Hymenoptera (Proctotrypoidea), No. 4," by Alan P. Dodd; "Prodiscothyrea, a new genus of

Ponerine Ants," by Professor W. M. WHEELER, communicated by A. M. Lea; "On the Occurrence of *Arenicola loveni* on the Coast of South Australia," by J. H. ASHWORTH, D.Sc., communicated by E. R. Waite, F.L.S.; "A New Species of Leech from South Australia," by W. H. LEIGH-SHARPE, B.Sc., communicated by E. R. Waite; "Additions to the Flora of South Australia, No. 9," by J. M. BLACK.

ORDINARY MEETING, JUNE 8, 1916.

THE PRESIDENT (J. C. Verco, M.D., F.R.C.S.) in the chair.

NOMINATION.—Lionel B. Bull, pathologist and bacteriologist, was nominated as Fellow.

ELECTION.—W. Champion Hackett, seedsman, was elected a Fellow.

EXHIBITS.—Mr. E. R. WAITE exhibited a common Adelaide flounder, which was ambi-coloured, the lower side the same colour as the upper. The prolonged dorsal fin had not, as usual, joined the snout, an apparent incision being thus left between the fin and the skull, so that the fish could see on its under-side. Also a somewhat rare pelagic prawn from the mouth of the Gawler River. Captain S. A. WHITE showed some shells *(Turbo stamineus)*, weighing from 8 oz. to 10 oz. each (when alive), and a Pacific Gull *(Gabianus pacificus)*, which was stated to carry these shells aloft and drop them on the rocks to break them. Dr. Morgan had suggested that, as the gull could only carry them in its beak, its balance in flight would be disturbed by so doing, and that this work was really done by the Osprey *(Pandion haliaëtus cristatus)*, which had talons suitable for the purpose. The balance of opinion amongst the Fellows present was in favour of the gull, but further observation was deemed necessary. He also showed two immature skins of the Mutton Bird *(Neonectris tenuirostris brevicaudus)*, showing the growth of the down on the tip of the feathers, so that when the down came off the bird was fully fledged. Also a new species of Scrub Wren, which he was describing as *Sericornis longirostris wyldei* (Coorong Scrub Wren). Mr. A. M. LEA showed a large moth *(Trictena labyrinthica)*, which laid over 31,000 eggs in captivity, and one of its larvae, which had been destroyed by a curious parasitic fungus. Also some small water beetles *(Necterosoma penicillatum)* taken out of very

salt water, the only case he knew of beetles in a salt-water *habitat*, although several mosquitoes and some true bugs were found in the open ocean. Dr. COOKE showed photographs of remains of ovens of aboriginals, which had been revealed by the shifting of the covering sand. They consisted of groups of stones on which, when heated, the food had been cooked. Several Fellows referred to similar finds, and Mr. Howchin stated that he had recovered fragments of emu eggs from an aboriginal kitchen-midden near Hallett's Cove.

PAPERS.—"Revision of the Genus *Stigmodera*," by H. J. CARTER, B.A., F.E.S.; "Notes on the Lord Howe Island *Phasma*, and on an Associated Longicorn Beetle," by A. M. LEA, F.E.S.

ORDINARY MEETING, JULY 13, 1916.

THE PRESIDENT (J. C. Verco, M.D., F.R.C.S.) in the chair.

NOMINATION.—Harold Gordon Darling, merchant, was nominated as Fellow.

ELECTION.—Lionel B. Bull, pathologist and bacteriologist, Adelaide Hospital, was elected a Fellow.

EXHIBITS.—Mr. E. ASHBY, M.B.O.U., exhibited three birds—*viz.*, *Ptilotis sonora* (Singing Honey-eater), *Acanthogenys rufogularis* (Spiny-cheeked Honey-eater), and *Meliphaga phrygia* (Warty-faced Honey-eater). The first two have this June visited Blackwood in large numbers, probably for the first time; the last appeared in that district twelve years ago. Captain S. A. WHITE, M.B.O.U., exhibited three birds—*viz.*, *Ptiloris paradisea* (Rifle Bird), from the dense tropical forests of Northern Queensland; *Craspedophora magnifica* (Lesser Rifle Bird), *habitat* Northern Queensland and Barnard Islands; and *Cicinnurus regia* (King Bird of Paradise), the Goby-goby of the Aru Island natives, found in New Guinea and the islands of Aru and Mysol, in the thickest part of the forest and feeding on various fruits, often of a large size for so small a bird. Mr. A. M. LEA, F.E.S., showed four mealy bugs, *Monophlebus crawfordi*, densely covered with a long woolly-looking growth, which continues to grow after the insect's death, being gradually forced through the pores by the shrinkage of the skin until thoroughly dry; also a walking-stick insect with two horny growths on the head, and a scorpion, six inches long, from the Flinders

Range. Captain S. A. White, referring to his remarks last month about the carriage of heavy shells by the Pacific Gull, stated that both Mr. W. G. Randall, of Port Lincoln, and the second lightkeeper at Althorpe Island, stated that they had seen the gull lift the shells of *Turbo stamineus*, and the President quoted Dr. Murray Levick as asserting that he had seen Skua gulls carrying carcases heavier than their own weight. Staff-Sergeant A. R. Riddle (with the permission of his O.C., Lieut.-Colonel R. S. Rogers) exhibited a series of X-ray plates made with the "Coolidge" tube at the Keswick Military Hospital. One "Coolidge" tube can be adjusted to various degrees of hardness. There is also no fluorescence, and the focal spot on the anode or anti-cathode does not wander, and very sharp pictures are obtained. The beautiful bone texture effects are a noticeable feature.

Papers.—"Auroral Observations at Cape Royds Station, Antarctica," by Sir Douglas Mawson, D.Sc. (introduced in the author's absence by Mr. W. Howchin, F.G.S.); "*Hyalostelia australis*, the anchoring spicules of a Hexactinellid Sponge from the Lower Silurian Rocks of the MacDonnell Ranges," by R. Etheridge, Jun. (also introduced by Mr. Howchin); "The Australian Ants of the genus *Aphaenogaster*, Mayr," by W. M. Wheeler (communicated by A. M. Lea, F.E.S.); "Acarians from Australian and Tasmanian Ants and Ant-nests," by Nathan Banks (communicated by A. M. Lea, F.E.S.); "Lepidoptera of Broken Hill, Part 2," by Oswald B. Lower, F.Z.S., F.E.S.

Ordinary Meeting, August 10, 1916.

The President (J. C. Verco, M.D., F.R.C.S.) in the chair.

Election.—H. G. Darling, merchant, was elected a Fellow.

Mr. E. Ashby reported the substance of a letter sent by the Fauna and Flora Protection Committee of the Field Naturalists' Section to the Hon. Commissioner of Crown Lands *re* Kangaroo Island Reserve and the destruction of Euros in the Mount Remarkable district. A suggestion that the Fauna and Flora Protection Committee of the Field Naturalists' Section be formed into a separate Section of the Society was referred to the Field Naturalists' Section and to the Council for consideration.

THE PRESIDENT, in response to a question, explained the action taken by the Council with respect to the vacant directorship of the Adelaide Botanic Garden.

EXHIBITS.—Mr. A. M. LEA exhibited some mealy bugs *(Monophlebus crawfordi)* with some minute parasitic blue flies *(Lestophonus iceryae)* reared from the same; they are well known as also attacking the cottony-cushion scale *(Icerya purchasi);* also the strikingly-distinct sexes of a paradise fly *(Callipappus),* the male having two beautiful gauzy wings and a tuft of glossy filaments for a tail; the female was destitute of wings, tail, or eyes; also two collections of beetles from Northern Queensland. Captain S. A. WHITE showed *Paradisea apoda* (Great Bird of Paradise) from the Aru Islands; *Rupicola* sp. (Manakin or Cock of the Rock) from South America; *Erythropitta macklotii yorki* (Blue-breasted Pitta), from Cape York, Queensland, and *Coloburis versicolor* (Noisy Pitta), found in Southern Queensland and New South Wales. Mr. WALTER HOWCHIN showed consolidated river gravels from pits near Bower, on the Morgan branch railway. The alluvium consists of rounded stones varying in size from a pea to a hen's egg, and forms a low ridge on both sides of the railway, and apparently trending to the south-east. As no stream now exists in the neighbourhood, the gravel must have been laid down by a drainage system now extinct, and by a no mean river, now dead. It has been extensively worked for railway ballast.

PAPERS.—"Note on a High-level Occurrence of a Fossiliferous Bed of Upper Cainozoic Age in the Neighbourhood of the Murray Plains," by WALTER HOWCHIN, F.G.S.; "Mineral Notes," by Sir DOUGLAS MAWSON, D.Sc.; "Chemical Notes on Davidite," by W. T. COOKE, D.Sc.; "A Noteworthy Occurrence of Biotite-Mica," by EVAN R. STANLEY, F.G.S.

ORDINARY MEETING, SEPTEMBER 14, 1916.

THE PRESIDENT (J. C. Verco, M.D., F.R.C.S.) in the chair.

THE PRESIDENT referred to the bestowment of the Victoria Cross upon Captain Blackburn, a son of the late Canon Blackburn, a former president of the Society and a large contributor to its Transactions. Another of the late Canon's sons was wounded in Gallipoli and is still at the front, while a third son is serving as Lieut.-Colonel in the Army Medical Corps.

The Hon. Secretary announced the gift by the President to the Society of a handsome presidential chair.

Exhibits.—Mr. S. Dixon (on behalf of Mr. G. G. Mayo) showed a specimen of dimorphism in *Pittosporum undulatum*, which was, he believed, now recorded for the first time. Mr. A. M. Lea showed seed-vessels of the tree, *Pisonia brunoniana*, the "Ahmmoo" of the Queensland natives. These seeds exude a kind of bird-lime, which entraps insects by the thousand, and has been known to catch nutmeg pigeons, sparrows, and silver-eyes. A species of pirate bug, however, which preys on the trapped insects, suffers no inconvenience from the exudation, and even lays its eggs on the seeds. Mr. Lea had obtained many curious specimens of insects by removing the bird-lime with turpentine. Dr. Pulleine showed an aboriginal scraper, from Wilcannia, very similar to two prehistoric scrapers from Zurich, which he exhibited for comparison.

Papers.—"Vocabularies of Three South Australian Native Languages," by J. M. Black; "List of the Fishes of Norfolk Island," by E. R. Waite, F.L.S.; "Additions to the Fish Fauna of Lord Howe Island, No. 5," by A. R. McCulloch and E. R. Waite, F.L.S.; "Geology of Mount Remarkable," by Walter Howchin, F.G.S., with "Petrographical Notes on the Basic Igneous Rocks of the Foot Hills of Mount Remarkable," by E. O. Thiele, D.Sc.; "Notes on Some Miscellaneous Coleoptera, with Descriptions of New Species, Part 2," by A. M. Lea, F.E.S.

Annual Meeting, October 10, 1916.

The President (J. C. Verco, M.D., F.R.C.S.) in the chair.

The Annual Report and Balance-sheet were read and adopted.

Election of Officers.—President, J. C. Verco, M.D., F.R.C.S.; *Vice-Presidents*, Professor E. H. Rennie, M.A., D.Sc., F.C.S., and Lieut.-Colonel R. S. Rogers, M.A., M.D.; *Hon. Treasurer*, W. B. Poole; *Members of Council*, Professor R. W. Chapman, M.A., B.C.E., and W. Howchin, F.G.S.; *Hon. Auditors*, W. L. Ware, J.P., and H. Whitbread; *Representative Governor* on Board of Public Library, etc., Walter Howchin, F.G.S.

Exhibits.—Mr. A. M. Lea exhibited larvae (recently received from Mr. L. A. Beck) of a saw-fly *(Perga dorsalis)*.

These live in clusters on eucalyptus twigs, and when alarmed simultaneously wriggle their tails, from which they exude a slimy liquid. They are distasteful to almost all birds except cuckoos. He also exhibited some interesting specimens from the stomachs of birds.

Papers.

Note on **Edenttellina typica**, Gatliff and Gabriel.

By Jos. C. Verco, M.D. (Lond.), F.R.C.S.

[Read October 10, 1916.]

1911: Proc. Roy. Soc. Vict., vol. xxiv. (N.S.), part i., p. 190, pl. xlvi., figs. 5, 6.

1911, Verco: Trans. and Proc. Roy. Soc. S. Aus., vol. xxxvi., p. 238.

1912, Hedley: Rec. Austr. Mus., vol. viii., No. 3, p. 134.

Taken in shell sand, Guichen Bay; several right and left valves, and one complete shell. The dimensions of this were 5·1 mm. transversely, 3·25 mm. umboventrally, and 3·35 mm. in its greatest vertical diameter posteriorly; so that they are nearly equal to 1·75 those of the type. Mr. Hedley was disposed to think the valves were the internal shell of a Tectibranch rather than the right and left valves of a Pelecypod; but the species is plainly a bivalve. The valves are somewhat gaping behind. Only the right valve possesses the horn on its umbo. This horn is opaque-white, is smooth and nearly flat on its right or outer side, where its spiral cannot be seen; but on its left or inner side it is centrally depressed, and its coil can be detected, though here also, as elsewhere, it is opaque and smooth, as though covered with callus. The horn sends a white opaque curved offshoot posteriorly into the greenish substance of the valve. There is a very slightly-raised collar of the shell substance where the horn is inserted into it.

On viewing the closed valves under the lens the dorsum shows no projecting ligament, but a long, narrow, excavated gutter with bevelled edges, about two and a half times as long behind the umbo as in front. Within the right valve, springing from a narrow hingeplate, is an elongate narrow tooth arising somewhat in front of the base of the horn, directed not quite parallel with the border of the valve, but inclining medially and becoming higher and thicker forward,

with a groove between it and the border for the reception of the corresponding anterior tooth of the left valve, which consequently lies outside the right tooth and is somewhat longer than this, so as to extend slightly beyond it anteriorly. Just outside the base of the right tooth is a short lanceolate elevation, scarcely to be dignified with the name of a tooth, fitting into a complementary depression in the left valve. In the right valve, in front of the horn, outside the gutter for the left anterior tooth, is a linear roughened depression within the border of the valve, for the attachment of a long narrow ligament, which passes beneath the base of the horn, within the margin of the shell, and here gradually widens. Here, too, the area is very slightly hollowed out, and the margin of the hingeplate or ligament-plate is also somewhat excavated, as though the ligament here were thicker and even projected into the cavity of the shell. Beyond the horn, posteriorly, the ligamental depression gradually narrows again until it vanishes, being rather more than twice as long as the anterior part. There is a corresponding rough ligamental area in the left valve, though the hollowing of it beneath the horn does not seem to be so decided. In the posterior third is a linear depression to receive the sharp margin of the right valve.

Judging from the several detached valves, taken at the same spot as the perfect specimen, the following changes would seem to occur with advancing age. The two anterior teeth become much larger and more solid, and especially does that in the left valve, where it bends in ventrally at the end so as apparently to curve round the anterior end of the right tooth. The hingeplate becomes very solid and straight (losing the sub-umbonal depression), except near the left tooth, where it also curves. The ligamental area gets wide and rough and deep, and in some cases winds round the dorsal surface of the left tooth, so as to make a depression in the margin of the valve.

The presence of the very valid anterior teeth makes the name of the new genus created for this species, *Edenttellina*, inappropriate, as it is by no means edentulous.

"Additions to the Flora of South Australia, No. 10," by J. M. Black; "South Australian Eucalypts and their Essential Oils," by R. T. Baker, F.L.S., and H. G.

Smith, F.C.S.; "New Australian Lepidoptera of the Family Tortricidae," by A. Jefferis Turner, M.D., F.E.S.; "Descriptions of New Australian Micro-Lepidoptera," by Oswald B. Lower, F.E.S., F.Z.S.

ANNUAL REPORT, 1915-16.

The annual volume of Transactions will show that the work of the Society has been well sustained. It will include further contributions on Geology by Mr. Walter Howchin, on Entomology by Mr. A. M. Lea, Mr. O. B. Lower, and Mr. A. P. Dodd, on Botany by Mr. J. M. Black, and on Ichthyology by Mr. E. R. Waite, as well as information obtained from experts beyond the State on specimens forwarded to them for determination and description from the South Australian Museum. Two valuable papers on Australian native tribes have been brought before the Society—*viz.*, "The Wowarra Tribe of North-western Australia, with Grammar and Vocabulary," by Mr. J. R. B. Love, and "Vocabularies of Three South Australian Native Languages," by Mr. J. M. Black; but owing to the pressure upon both space and funds their publication will be reluctantly postponed to a future volume.

The evening meetings have been enlivened by the exhibition of many objects of scientific interest.

The efforts of the Society to secure the establishment of a Reserve for Native Fauna and Flora on Kangaroo Island have been continued, but the promised Act of Parliament for this purpose has not yet been introduced. The Society has also interested itself in the matter of reorganizing the control of the Adelaide Botanic Garden, with a view to increasing its scientific and economic value. This question is still under discussion by the Government and the Board of Governors of the Garden.

Our Honorary Fellow, Professor W. H. Bragg, has received further recognition by the award to him, in conjunction with his son, of the Nobel Prize for their researches in connection with radio-activity, and our Fellow, Sir Douglas Mawson, has been awarded the Helen Culver Medal of the

Geographical Society of Chicago for his achievements as leader of the Australasian Antarctic Expedition. It was the wish of Sir Douglas that the scientific results of this expedition should be published by this Society, but difficulties having arisen they are being issued independently. Our Transactions will, however, include the valuable Auroral Observations made at Cape Royds during his former sojourn in Antarctica, when a member of the Shackleton Expedition.

Two grants in aid of research have been made during the year—one for investigations into the flight of birds, and the other for the study of the biology of *Lobelia gibbosa*. The results will be laid before the Society in due course.

The growth of the Library continues as the number of our exchanges with other societies increases. It has been found necessary to add to our shelving and to place the stock of our own publications in the basement. The binding of the books has, thanks to the generosity of the President, been continued, but as it is now well advanced, the special fund for the purpose expended, and the cost per volume considerably increased, the Council has decided to discontinue this work for the present.

We have lost several from our list of Fellows. Amongst these may be mentioned Dr. W. L. Cleland, who has just resigned after a membership of thirty-seven years, during a considerable part of which he filled the position of Hon. Secretary. The Right Hon. Sir Samuel J. Way, Chief Justice, who died early in the year, was the oldest Fellow on our roll, having joined the Adelaide Philosophical Society, as it was then called, in 1859. He filled the President's chair for the two years 1880-82. Mr. Robert Barr Smith, who died in 1915, had been a Fellow since 1871. He bequeathed to the Society £1,000, which will be payable shortly, when it will be added to the Endowment Fund, and the income derived from it will be available for the furtherance of the Society's work.

The membership now comprises 10 Honorary Fellows, 5 Corresponding Members, 75 Fellows, and 1 Associate.

Jos. C. Verco, *President.*

Walter Rutt, *Hon. Secretary.*

September 30, 1916.

ROYAL SOCIETY OF SOUTH AUSTRALIA (INCORPORATED).

Revenue and Expenditure for 1915-16.

	£ s. d.	£ s. d.
To Balance October 1, 1915		313 12 5
,, Subscriptions—		
Royal Society	91 12 0	
Field Naturalists' Section ...	23 5 0	
Malacological Section ...	2 12 6	
		117 9 6
,, Grants from Government—		
On Subscriptions	73 8 6	
For Printing Reports and Scientific Investigations ...	150 0 0	
		223 8 6
,, Receipts for use of Room by other Societies		5 16 0
,, Sale of Publications		14 13 4
,, Savings Bank Interest	5 0 0	
,, Interest transferred from Endowment Fund	76 12 6	
		81 12 6
,, Donations—		
Dr. Verco	100 0 0	
Captain White	14 18 0	
		114 18 0

	£ s. d.	£ s. d.
By Transactions—		
Printing	257 2 0	
Illustrating	90 6 0	
Publishing	2 4 6	
		349 12 6
,, Grant to Field Naturalists' Section		25 0 0
,, Library—		
Librarian, Cataloguing, Receiving, and Issuing ...	55 10 0	
Binding	76 16 3	
Purchase and Carriage of Books	1 12 0	
		133 18 3
,, Sundries—		
Cleaning and Lighting ...	11 9 0	
Printing, Postages, and Stationery	14 9 1	
Advertising	3 5 8	
Insurance	2 10 7	
		31 14 4

						Savings Bank of S.A.	...	105 7 2
						Bank of Australasia ...	...	224 1 0
						Cash in hand	...	1 17 0
								331 5 2
				£871	10 3			£871 10 3

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——— ——— Yearbook, 1915. Wash. 1916.

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——— ——— Bull., 544, 559-73, 580 LP, 581 E, 582-96, 598-609, 611-617, 620 A-NP, 621 A-D G-LNO. Wash. 1914-16.
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——— ——— Mineral resources, 1914, pt. 1, no. 1A, 1-24; pt. 2, no. 1-34; 1915, pt. 1, no. 1A. 1914-15.
——— ——— Monograph, no. 53-54. 1915.
——— ——— Professional paper, 87-88, 90 I-L, 95 A-I. 1915.
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——— ——— Water-supply paper, 312, 331, 338, 340 F-L, 341-3, 345 HI, 349-359, 365-8, 370-3, 375 A-F, 376-9, 385, 388, 397, 400 A. Wash. 1914-15.
——— *Library of Congress.* Report, 1915.
——— *National Museum.* Annual report, 1915.
——— ——— Bull., 82, vol. 1, pt. 1; 91; 92, vol. 1-2. 1915.
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LIST OF MEMBERS

AS EXISTING ON

SEPTEMBER 30, 1916.

Those marked with an asterisk have contributed papers published in the Society's Transactions.

Any change in address should be notified to the Secretary.

NOTE.—The publications of the Society will not be sent to those whose subscriptions are in arrears.

Date of Election.

HONORARY FELLOWS.

1910. *BRAGG, W. H., M.A., F.R.S., Professor of Physics, University College, London (Fellow 1886).
1893. *COSSMAN, M., Rue de Maubeuge, 95, Paris.
1897. *DAVID, T. W. EDGEWORTH, C.M.G., B.A., D.Sc., F.R.S., F.G.S., Professor of Geology, University of Sydney.
1890. *ETHERIDGE, ROBERT, jun., Curator of the Australian Museum of New South Wales, Sydney.
1905. GILL, THOMAS, I.S.O., Under-Treasurer, Adelaide.
1905. *HEDLEY, CHAS. H., Assistant Curator, Australian Museum, Sydney.
1892. *MAIDEN, J. H., F.L.S., F.C.S., Director Botanic Gardens, Sydney, New South Wales.
1898. *MEYRICK, E. T., B.A., F.R.S., F.Z.S., Tohrnhanger, Marlborough, Wilts, England.
1894. *WILSON, J. T., M.D., Ch.M., Professor of Anatomy, University of Sydney, New South Wales.
1912. *TEPPER, J. G. O., F.L.S., Elizabeth Street, Norwood (Corresponding Member 1878, Fellow 1886).

CORRESPONDING MEMBERS.

1913. *CARTER, H. J., B.A., Wahroonga, New South Wales.
1909. *JOHNCOCK, C. F., Clare.
1893. *STRETTON, W. G., Darwin, Northern Territory.
1905. THOMSON, G. M., F.L.S., Dunedin, New Zealand.
1908. *WOOLNOUGH, WALTER GEORGE, D.Sc., F.G.S., Professor in Geology, University of Perth (Fellow 1902).

FELLOWS.

1895. *ASHBY, EDWIN, M.B.O.U., Blackwood.
1902. *BAKER, W. H., F.L.S., Glen Osmond Road, Parkside.
1908. *BENSON, W. NOEL, B.Sc., University, Sydney.
1907. *BLACK, J. MCCONNELL, 1, Brougham Place, North Adelaide.
1909. BRADLEY, EDGAR J., C.E., Hydraulic Engineer's Department, Adelaide.
1912. *BROUGHTON, A. C., Young Street, Parkside.
1911. BROWN, EDGAR J., M.B., D.Ph., 3, North Terrace.

1883. *Brown, H. Y. L., F.G.S., 286, Ward Street, North Adelaide.
1893. Brummitt, Robert, M.R.C.S., Medindie.
1916. Bull, Lionel B., Pathologist and Bacteriologist, Adelaide Hospital.
1906. Bundey, Miss Ellen Milne, 148, Molesworth Street, North Adelaide.
1907. *Chapman, R. W., M.A., B.C.E., Professor of Mathematics and Mechanics, University of Adelaide.
1904. Christie, W., 49, Rundle Street, Adelaide.
1895. *Cleland, John B., M.D., Government Bureau of Microbiology, Sydney, New South Wales.
1907. *Cooke, T. W., D.Sc., Lecturer, University of Adelaide.
1912. Corbin, H., B.Sc., Forest Department, Adelaide.
1914. Cornish, K. M., Coast View, Adelaide Road, Glenelg.
1916. Darling, H. G., Franklin Street, Adelaide.
1914. Darroch, D. G., Australian United Paint Co., Port Adelaide.
1912. Desmond, J., Currie Street, Adelaide.
1887. *Dixon, Samuel, Bath Street, New Glenelg.
1915. Dodd, Alan P., Kuranda, N. Queensland.
1911. Dutton, H. H., Anlaby.
1902. Edquist, A. G., Tate Terrace, Croydon.
1914. Ferguson, E. W., M.B., Ch.M., Gordon Road, Roseville, Sydney.
1904. Gordon, David, c/o D. & W. Murray, Gawler Place, Adelaide.
1880. *Goyder, George, A.M., F.C.S., Gawler Place, Adelaide.
1910. *Grant, Kerr, M.Sc., Professor of Physics, University of Adelaide.
1904. Griffith, H., Brighton.
1916. Hackett, W. C., Rundle Street, Adelaide.
1916. Hancock, H. Lipson, A.M.I.C.E., M.I.M.M., M.Am.I.M.E., Moonta Mines.
1896. Hawker, E. W., F.C.S., East Bungaree, Clare.
1883. *Howchin, Walter, F.G.S., Lecturer in Geology and Palæontology, University of Adelaide.
1911. Hughes, Herbert W., Booyoolie, Gladstone.
1912. Jack, R. L., B.E., Assistant Government Geologist, Adelaide.
1893. James, Thomas, M.R.C.S., Moonta.
1910. *Johnson, E. A., M.D., M.R.C.S., 295, Pirie Street, Adelaide.
1915. Laurie, D. F., Agricultural Department, Victoria Square.
1897. *Lea, A. M., F.E.S., South Australian Museum, Adelaide.
1884. Lendon, A. A., M.D. (Lond.), M.R.C.S., Lecturer in Obstetrics, University of Adelaide, and Hon. Physician, Children's Hospital, North Adelaide.
1888. *Lower, Oswald B., F.Z.S., F.E.S., Wayville.
1914. Mathews, G. M., F.R.S.E., F.L.S., F.Z.S., Langley Mount, Watford, Herts, England
1905. *Mawson, Sir Douglas, D.Sc., B.E., Lecturer in Mineralogy and Petrology, University of Adelaide.
1874. Mayo, Geo. G., C.E., 90, Hill Street, North Adelaide.
1907. Melrose, Robert Thomson, Mount Pleasant.
1897. *Morgan, A. M., M.B., Ch.B., Angas Street, Adelaide.
1913. *Osborn, T. G. B., M.Sc., Professor of Botany, University of Adelaide.

1886. Poole, W. B., Savings Bank, Adelaide.
1911. Poole, T. S., B.A., LL.B., *Register* Chambers, Grenfell Street.
1908. Pope, William, Eagle Chambers, King William Street.
1907. Pulleine, Major R. H., M.B., North Terrace, Adelaide.
1916. Ray, William, M.B., B.Sc., Victoria Square, Adelaide.
1885. *Rennie, Edward H., M.A., D.Sc. (Lond.), F.C.S., Professor of Chemistry, University of Adelaide.
1913. Riddle, Staff-Sergt. A. R., No. 7 A.G. Hospital, Keswick.
1911. Roach, B. S., Education Department, Flinders Street, Adelaide.
1905. *Rogers, Lieut.-Col. R. S., M.A., M.D., Flinders Street, Adelaide.
1869. *Rutt, Walter, C.E., College Park, Adelaide.
1914. Saunders, M. E., Wood Street, Millswood.
1891. Selway, W. H., Treasury, Adelaide.
1893. Simson, Augustus, J.P., Launceston, Tasmania.
1906. Snow, Francis H., National Mutual Buildings, King William Street.
1910. *Stanley, E. R., Government Geologist, Port Moresby, Papua.
1881. *Stirling, Edward C., C.M.G., M.A., M.D., F.R.S., F.R.C.S., Professor of Physiology, University of Adelaide, Hon. Curator of Ethnology, South Australian Museum.
1907. Sweetapple, H. A., M.D., Park Terrace, Parkside.
1897. *Torr, W. G., LL.D., M.A., B.C.L., Brighton, South Australia.
1894. *Turner, A. Jefferis, M.D., F.E.S., Wickham Terrace, Brisbane, Queensland.
1878. *Verco, Joseph C., M.D. (Lond.), F.R.C.S., Consulting Physician Adelaide Hospital and Children's Hospital.
1883. Wainwright, E. H., B.Sc. (Lond.), Tower House, Glenelg.
1914. *Waite, E. R., F.L.S., Director South Australian Museum.
1912. Ward, Leonard Keith, B.A., B.E., Government Geologist, Adelaide.
1878. Ware, W. L., King William Street.
1907. Webb, Noel A., Barrister, Waymouth Street, Adelaide.
1904. Whitbread, Howard, c/o A. M. Bickford & Sons, Currie Street, Adelaide.
1912. *White, Captain S. A., M.B.O.U., "Weetunga," Fulham, South Australia.
1912. *Zietz, F. R., South Australian Museum.

Associate.

1904. Robinson, Mrs. H. R , "Las Conchas," Largs Bay, South Australia.

APPENDICES.

FIELD NATURALISTS' SECTION

OF THE

Royal Society of South Australia (Incorporated).

THIRTY-THIRD ANNUAL REPORT OF THE COMMITTEE.

FOR THE YEAR ENDED SEPTEMBER 19, 1916.

Your Committee reports that the work of this Section of the Royal Society has been carried on successfully during the year. The monthly meetings have been well attended and the field excursions have been widely availed of to increase the acquaintance of the members with various branches of natural history.

The year opened with a membership of 121; 20 new members have been added and 12 resigned, the roll now standing at 129.

The series of winter lectures was continued during the year, and the Committee desires to place on record its thanks to the various gentlemen who have lectured.

At the annual meeting, held on Tuesday, September 20, 1915, the following officers were elected for the ensuing year: —*Chairman*, Captain S. A. White, M.B.O.U., R.A.O.U.; *Vice-Chairmen*, Professor T. G. B. Osborn, M.Sc., and Mr. A. R. Riddle; *Hon. Treasurer*, Mr. B. B. Beck; *Hon. Librarian*, Miss I. Roberts; *Hon. Secretary*, Mr. P. H. E. Runge; *Hon. Assistant Secretary*, Miss E. Hocking; *Committee*—Dr. R. S. Rogers, M.A., M.D., Mr. W. J. Kimber, Mr. J. W. Mellor, R.A.O.U., Mr. E. H. Lock, F.R.H.S., Mrs. R. S. Rogers, Mr. W. H. Selway, Mr. R. Llewellyn, and Mrs. J. F. Mellor; *Auditors*, Messrs. Walter D. Reed and A. W. Drummond.

The Hon. Secretary, Mr. P. H. E. Runge, resigned office on December 17, 1915. The resignation was accepted with deep regret, Mr. Runge having proved himself a most enthusiastic and painstaking secretary during the three and a half

years he had acted in that capacity. On March 17, 1916, the Committee elected Mr. Wm. Ham to fill the position till the annual meeting in September.

The following were elected to form the Native Fauna and Flora Protection Committee:—*Chairman*, Mr. E. Ashby; *Hon. Secretary*, Mr. P. H. E. Runge; Dr. R. S. Rogers, Dr. W. Ramsay Smith, Dr. R. H. Pulleine, Messrs. J. W. Mellor, W. H. Selway, J. M. Black, A. G. Edquist, E. H. Lock, A. M. Lea, S. Angel, J. Willmott, R. Llewellyn, and S. Stokes.

The first evening meeting of the year was held on October 21, 1915, when Professor E. C. Stirling, F.R.S., C.M.G., M.D., delivered a most interesting address on "Some Aspects of Central Australian Aboriginal Life." The lecture, which was illustrated by a valuable and most interesting series of slides, dealt with the tribal customs and ceremonies of the aboriginals, particularly with those relating to intermarriage and the tribal totems.

On April 18, 1916, the meeting took the form of an exhibit evening, the greatest interest being displayed in cases of specimens shown by Mr. A. M. Lea, Museum Entomologist, who showed a case containing 6,666 specimens of beetles, etc., from the little-known Lord Howe Island. Mr. Lea stated that probably half were new to Science. The Kentia palm, the characteristic product of the island, had proved exceedingly productive of insect life. Of the many specimens, a phasma, locally termed "the land lobster," was of great interest. Mr. W. Weidenbach exhibited a case of insects collected from one garden at Glen Osmond during the short period of 18 months, and also a specimen of fire opal (a pseudomorph after a mussel shell), which came from the Stuart Range and formed part of the first parcel of precious opal so far found in South Australia. Mr. H. Barrett exhibited specimens of embolite from Broken Hill, beryls from Williamstown, and a piece of serpentinous marble. Mrs. J. F. Mellor exhibited the sword of a small swordfish, and also a banded snake. Captain White tabled several specimens of birds, including the common Cormorant and Pied Cormorant, besides the Arctic Skua and the Tippet Grebe. Mr. E. Drummond showed a sample of barytes (sulphate of barium) from Aldgate.

On May 17, 1916, Sergeant A. R. Riddle delivered a lecture on "Tramps with a Camera." It was illustrated by means of a series of slides from most artistic photographs taken by the lecturer himself, indicating the points of geological and physiographical interest on the coast of Southern Yorke Peninsula and the Far North of the State. These

were followed by a series of views of the salt lakes, and the gathering, carting, and shipping of the salt.

On June 21, 1916, Mr. William H. Dudley Le Souëf, C.M.Z.S., M.B.O.U., delivered a most interesting address on "The Nidification of Australian Birds." The lecturer showed a large series of splendid pictures, many of them being works of art, showing the birds of Australia, their nests and eggs, with specimen illustrations representing the colouration of feathers, etc.

Professor Edward H. Rennie, M.A. (Syd.), D.Sc. (Lond. and Melb.), addressed the members on July 19, 1916, on the subject of "Biology and Chemistry." The Professor dealt very fully with the most recent discoveries in synthetic chemistry, illustrating the principles on which the analysis and synthesis of various organic chemical compounds had been conducted. He also dealt briefly with the difficulties surrounding the artificial production of protoplasm, and referred to the recent theories of the chemical bases for the nutrient values of certain food stuffs.

On August 15, 1916, Mr. Edgar R. Waite, F.L.S., Director of the South Australian Museum, delivered a lecture on "Deep-sea Dredging." Mr. Waite spoke of his personal experiences in dredging and trawling off the coasts of New Zealand, New South Wales, and South Australia. With the aid of pictures and models the audience was taken over a trawling vessel and shown the gear, the nets, and the crew engaged in the work of trawling. The whole process was explained, from the dropping of the net into the water to the final emergence of the "cod end," filled with the finny spoils of the deep sea. The experiences of the lecturer were vividly described, and the slides from pictures taken by the lecturer himself added interest to the address.

Excursions.

The excursions during the year were well attended, and the thanks of the Committee are due to the gentlemen who acted as leaders on the occasions of the various outings.

On September 25, 1915, Mr. J. W. Mellor, R.A.O.U., led a party of members through the scrub near Teatree Gully, the chief work of the afternoon being the observation of the birds of the district, in which direction the party was very successful. A large number of flowers was also secured.

The excursion of October 13, 1915, to Kuitpo Forest Reserve was undertaken under the leadership of Mr. Walter Gill, F.L.S., Conservator of Forests. Members were shown over the Reserves at Kuitpo Forest, and a very profitable

afternoon was spent in inspecting the various varieties of trees, the leader explaining their qualities, mode of growth, and varying treatment. The botanists of the party also secured a good variety of wildflowers.

A party of fourteen members of the Section left Adelaide on October 8, 1915, for the Far North. Through the kindness of Mr. and Mrs. J. W. Lindo, of Moolooloo Station, in the Flinders Range about twelve miles from Blinman, they were able to spend a most interesting and profitable time in this little-known portion of the State. The members accomplished a great deal of field work, Mr. and Mrs. Lindo assisting by placing conveyances and horses at their disposal. Among the trips, some of the most interesting were made to the Blinman Mine, Ferguson Gorge, the Nuccaleena Mine, Duke's Nose, Mount Patawurta, and many other points of physiographical and geological interest in the Flinders Range. As this part of the State had not previously been worked by ornithologists, it proved a most interesting field for investigation, the bird-lovers of the party securing a fine variety of birds, among them one which was new to Science. The discoverer gave it the name of *Barnardius barnardi lindoi*, in honour of their host and hostess. To both geologists and botanists this part of the northern ranges offered a fruitful field for investigation. The Committee feels that it is under a debt of gratitude to Mr. and Mrs. Lindo for their generous hospitality on this occasion.

On October 30, 1915, Mr. A. M. Lea, F.E.S., led the party on an excursion to Ironbank, when flowers and insects were observed and a profitable afternoon was spent. The leader gave an interesting address on "Ants."

On November 20, 1915, members motored to Houghton, where, by the kind invitation of Mr. R. McEwin, the members visited his establishment and inspected the extensive plant for the manufacture of jam. The party then adjourned to the large orchard, where the Government Fruit Expert, Mr. G. Quinn, addressed the members on the subject of fruit culture.

On December 11, 1915, members travelled to the residence of the President (Captain White), at "Wetunga," Fulham. The visitors inspected Captain White's varied collection of specimens of natural history, particularly of birds from Australia and South Africa, together with specimens of shells from the same regions, and the interesting collection of curios from South Africa collected by Captain White when he was taking part in the Boer War. The members were hospitably entertained by Captain and Mrs. White.

On February 5, 1916, the members took part in a dredging expedition to the Outer Harbour. Many specimens of marine life were secured, and the leaders, Mr. Kimber and Dr. Pulleine, gave instructive talks (illustrated by the microscope) on the different forms of life secured in the dredges.

The outing on March 11, 1916, took the form of a motor trip to the Torrens Gorge, under the leadership of Sergeant A. R. Riddle. The leader drew attention to the geological formation of the gorge, pointed out the varying scenery produced by the differences in the underlying rocks, the rounded hills of the slates giving place to the bold, stern, rugged, and precipitous cliffs produced by the quartzites. The accompanying changes in the botany of the region were also dealt with. The visitors journeyed to the end of the constructed portion of the new road and walked by the side of the river, studying the effects of river action in the gorge, well illustrated in places by a series of pot holes in the riverbed. Some of the best specimens have been destroyed by making the new road, which, however, will render the beautiful scenery of this part of our hills much more easy of access.

On April 15, 1916, Mr. E. H. Lock, F.R.H.S., led the party on an excursion from Aldgate, when the members visited the extensive garden of Mrs. F. Caley Smith and admired the wonderful display of dahlias in full bloom. Before leaving Mrs. Caley Smith kindly entertained the party at afternoon tea. A visit was also made to the barytes mine, near Aldgate, where the process of mining and preparation of the material was inspected.

On May 8, 1916, a large party travelled by motor to the Millbrook Reservoir, which is in course of construction. The Resident Engineer (Mr. E. J. Bradley), a member of the Section for many years, went up with the party and afforded it every facility for viewing the works. The botanists of the party secured some characteristic plants of the locality.

The excursion to Glenelg and Henley Beach on May 13, 1916, was well attended. Mr. W. D. Reed led the party *viâ* the Patawalonga and along the shore from Glenelg to Henley Beach, members securing specimens of various forms of marine life, which formed the text of a short address by the leader. At the conclusion of the walk the members were entertained at "Wetunga" by the President and Mrs. White, and the specimens secured were examined and finally classified.

A visit to the South Australian Museum on June 3, 1916, under the guidance of the Director (Mr. Edgar R. Waite, F.L.S.), proved of great interest. The new wing of

the Museum was inspected and the arrangement of its contents noted. The ethnological collections, the magnificently-mounted specimens of Australian fauna, and the little aquaria were all greatly admired.

On June 5, 1916, the members spent the day at Hallett's Cove, under the leadership of Mr. Walter Howchin, F.G.S. Under his capable guidance the party was shown the permo-carboniferous glacial till of Hallett's Cove and the famous scratched pavement, still bearing evidences of the movement of the ice and furnishing silent, yet powerful, testimony to the remote existence of glaciers in this locality. The erratics brought by the ice from the south and east were examined, and many other interesting geological and physiographical features of interest were discussed.

On June 24, 1916, the Outer Harbour was visited, where, under the leadership of Mr. W. J. Kimber, the members found many objects of interest on Snowden Beach. The leader gave an informative address on the main types of shells, their characteristics, and their modes of growth, illustrated by carefully-selected and prepared type specimens, as well as by the shells collected by the members during the afternoon.

On July 15, 1916, Mr. R. Llewellyn led a large party along the beach from the Grange to the Semaphore. The tide was unfortunately extraordinarily high, and few specimens of value were secured, but the leader, by means of specimens and carefully-executed diagrams, indicated the broad lines of classification of seaweeds and explained their various methods of fructification and reproduction.

August 12, 1916, proved very inclement, and but few members braved the elements. They were met by Mr. E. Ashby on the Blackwood railway platform and shown through his gardens, especially admiring the section devoted to the native flora of South Australia, where there were several varieties of orchids and other native plants in bloom. An adjournment to Mr. Ashby's study enabled the members present to look over and admire his fine herbarium, collected from various parts of Australia. Following on this inspection, the members were treated to a lecturette on some orders of Australian birds, the points being brought out by the actual handling of specimens from Mr. Ashby's large collection.

On September 9, 1916, members motored to the hills above Teatree Gully. The leader (Mr. W. H. Selway) had chosen a most picturesque and productive part of the scrub for the walk, and members found a wealth of floral beauty on which to feast their eyes, as well as giving them the opportunity of securing needful specimens. Ten varieties of

orchids were found, and some rather rare species of other flowers were observed. The leader gave a short address on the Acacias, dealing with the characteristics of the more interesting varieties.

S. A. WHITE, *Chairman.*
WILLIAM HAM, *Hon. Secretary.*

TWENTY-EIGHTH ANNUAL REPORT OF THE NATIVE FAUNA AND FLORA PROTECTION COMMITTEE.

There have been four Committee meetings held during the year, but a great deal of useful work has been done in addition to that dealt with at the meetings of the Committee, some of it of a very confidential character, in which exact data of the illegal destruction of marsupials were obtained and made available to the right authorities with satisfactory results.

The Committee has been interested in the will of the late Miss Chewings, of Kent Town, who expressed the desire that her estate, which is valued at about £7,000, should be devoted for a period of twenty-one years to the cultivation of trees and bird life, etc., in the inland districts of Australia. The Committee, desiring to protect its own interests in the furtherance of these objects, authorized the Hon. Secretary (Mr. P. Runge) to obtain legal assistance and contest the case. Messrs. Scammel & Skipper were instructed to act for Mr. Runge. Though a final verdict has not been announced, it is thought that owing to the faulty construction of the will it is not likely that Miss Chewings' intention (as the Committee believes it to be) can be carried out.

The extensive destruction of Euros and other marsupials in the Flinders Range has been brought under the attention of the Commissioner, but as these animals are only protected for six months of the year—*viz.*, July 1 to December 31—infringements of the law are difficult to sheet home.

The Committee has felt that the most important work it has been called upon to undertake is that of the establishment of "Flinders Chase," and, incidental to it, the protection of the native marsupials throughout Kangaroo Island. The Chairman has had, by appointment, a most encouraging interview with the Premier in reference to the early introduction of the Flinders Chase Bill into Parliament, and at the

request of the Premier he had, later, a lengthy interview with the Commissioner of Crown Lands, who promised to bring before Cabinet the suggestions of the Committee.

Both by memorial and in personal interviews the Committee has urged upon the Government the importance of including Western River in the Fauna and Flora Reserve that it is proposed to call "Flinders Chase." In addition to the suitability of that part for the preservation of native fauna is that of future harbour and landing accommodation.

The Committee has recently urged upon the Government, through the Commissioner of Crown Lands, the desirability of protecting the fauna in the Cape Borda Lighthouse Reserve. To have such an unprotected area abutting on the Fauna and Flora Reserve is obviously most undesirable. The Commissioner has been asked to protect both kangaroos and opossums throughout the whole of Kangaroo Island, pending the introduction of the "Flinders Chase Bill." Both these matters are now under the consideration of the Department.

The Committee acknowledges with pleasure the support of its proposals given by Mr. W. H. Strawbridge, of Kingscote, Kangaroo Island.

The importance of the foregoing proposals has been emphasized by the rediscovery of the "Brush Kangaroo" in the south-east of South Australia. It is felt that it is highly desirable that specimens should be secured and placed in a properly-protected area as soon as possible.

The Committee, through the Chairman, offered its assistance to Captain S. A. White and the South Australian Ornithological Association in their praiseworthy efforts in getting "Carlot," near Mannum, declared a protected area. We are glad that Captain White is able to report the success already obtained, and trust that a further area may be secured.

The Committee has felt that the designation by which it is known—*viz.*, N.F. & F.P.C. of the F.N.S. of the R.S. of S.A.—is rather cumbersome, and has therefore (as was suggested by the late chairman, Mr. Dixon) suggested that it become either a section or a committee of the Royal Society. If the parent section approves, it is believed it will receive the sanction of the Royal Society.

Edwin Ashby, *Chairman.*
Percival Runge, *Hon. Secretary.*

Field Naturalists' Section of the Royal Society.

Statement of Receipts and Expenditure for Year ending September 1, 1916.

RECEIPTS.	£	s.	d.
By Credit Balance brought forward	23	14	7
,, Grant from Royal Society	25	0	0
,, Members' Subscriptions	23	5	0
,, Bank Interest	0	6	8
	£72	6	3
By Balance brought forward	£4	7	11

EXPENDITURE.	£	s.	d.
To Members' Subscriptions paid to Royal Society—			
1915	20	15	0
1916	23	5	0
,, Postages	4	8	11
,, Stationery	0	15	3
,, Hire of Hall and Lantern	2	9	5
,, Printing	13	6	0
,, Advertising	2	18	9
,, Credit Balance	4	7	11
	£72	6	3

Excursion Account.

	£	s.	d.
By Credit Balance	4	16	11
,, Excursion Fares	43	3	3
	£48	0	2
By Balance brought forward	£6	5	11

	£	s.	d.
To Hire of Motors	35	10	0
,, Hire of Steam Tug	5	10	0
,, Refreshments	0	1	9
,, Tips to Drivers	0	7	6
,, Repairs to Dredge	0	5	0
,, Credit Balance	6	5	11
	£48	0	2

Audited and found correct,

WALTER D. REED, F.C.P.A.,
A. M. DRUMMOND, } *Auditors.*

September 13, 1916.

MALACOLOGICAL SECTION

OF THE

Royal Society of South Australia (Incorporated).

Annual Report for the Year 1915-1916.

Seven meetings were held during the year. The membership remains the same as last year. The average attendance of members was six.

During the year over eighty species of shells, pertaining to the following genera, have been identified and classified:—*Pyrene*, *Cominella*, *Josepha*, *Pisania*, *Cantharus*, *Arcularia*, *Verconella*, *Murex*, *Coralliophila*, *Typhis*, *Trophon*, *Kalydon*, *Adamsia*, and *Thais*.

Some very interesting shells were exhibited from Robe by Dr. Verco, and a discussion on the methods in which molluscs deposit their eggs proved very entertaining.

Dr. Verco has been elected President for 1916-1917, and Dr. Torr, Hon. Secretary and Treasurer.

Receipts and Expenditure for the Year 1915-16.

Receipts.

	£	s.	d.
To Subscriptions	2	12	6
,, Debit Balance	0	3	6
	£2	16	0

Expenditure.

	£	s.	d.
By Debit Balance 1914-15	0	2	7
,, Cash Receipt Book and Postage	0	0	11
,, Subscription to Royal Society	2	12	6
	£2	16	0

William G. Torr, *Hon. Secretary and Treasurer.*

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[Generic and specific names printed in italics indicate that the forms described are new.]

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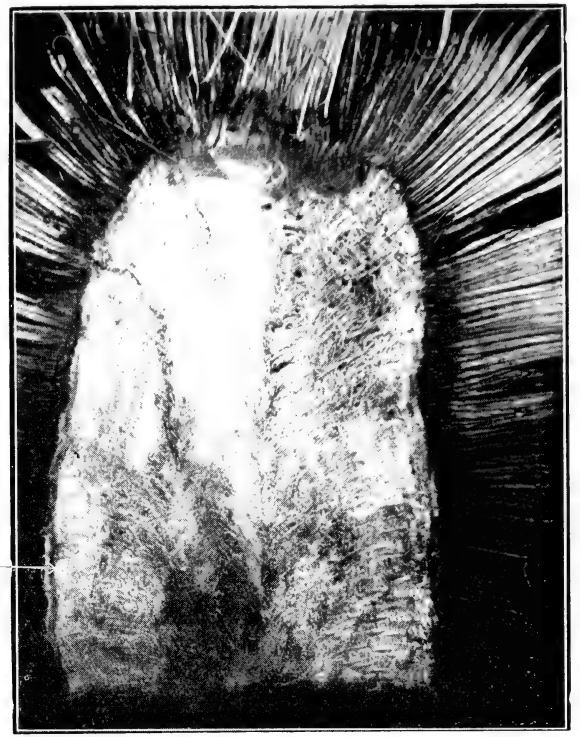

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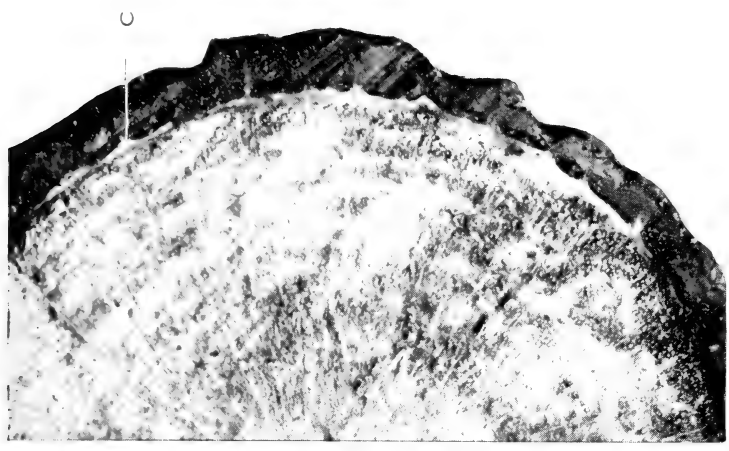

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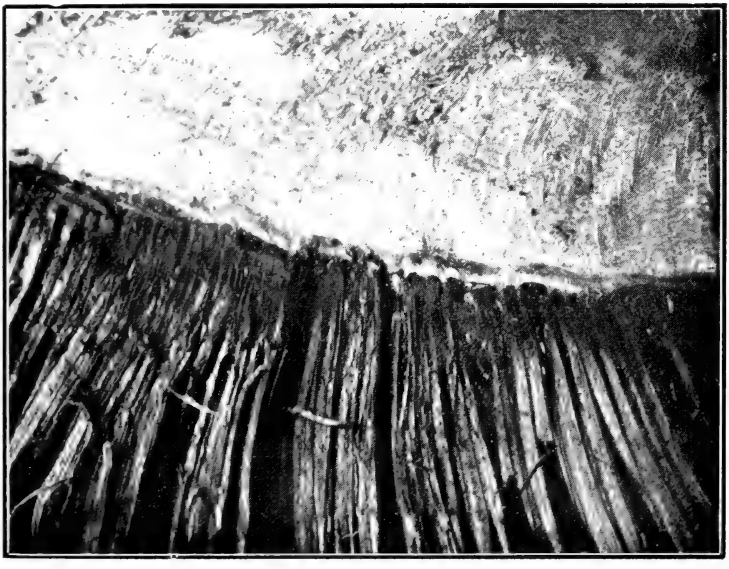

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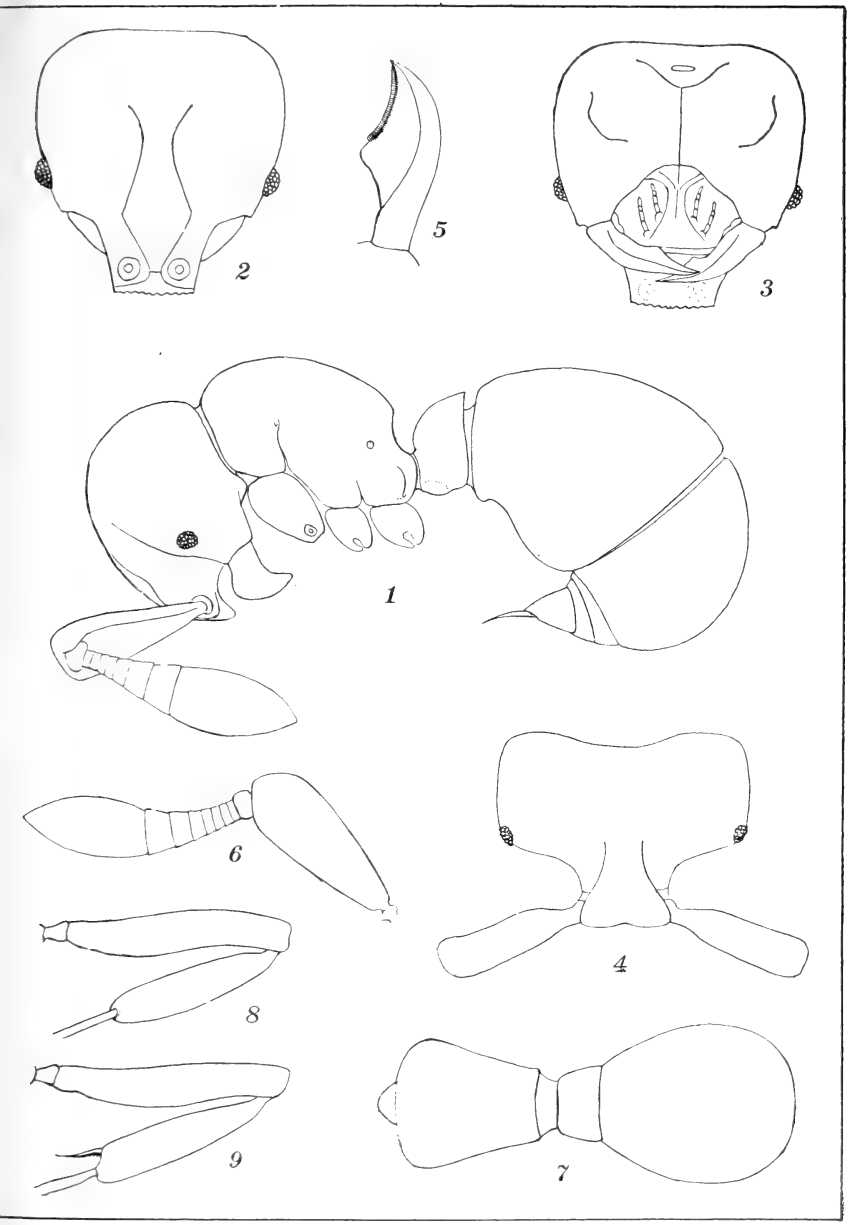
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Triodia lanata sp.nova

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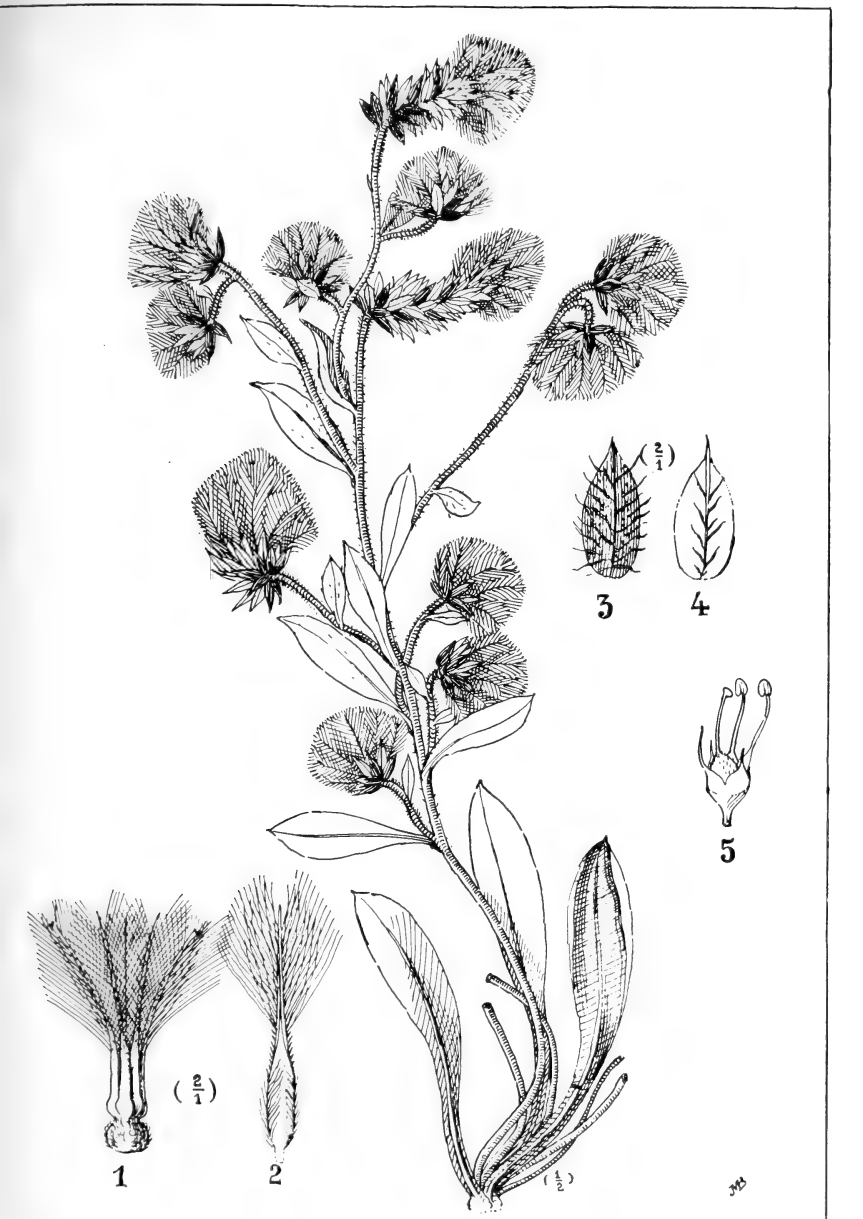

Trichinium seminudum

sp nova.

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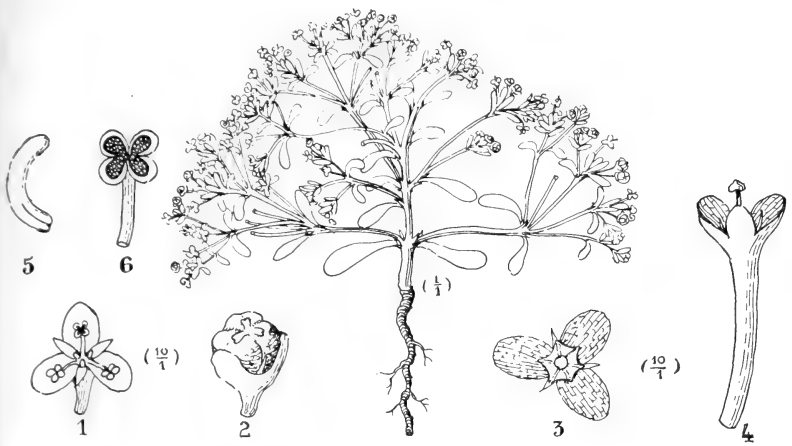
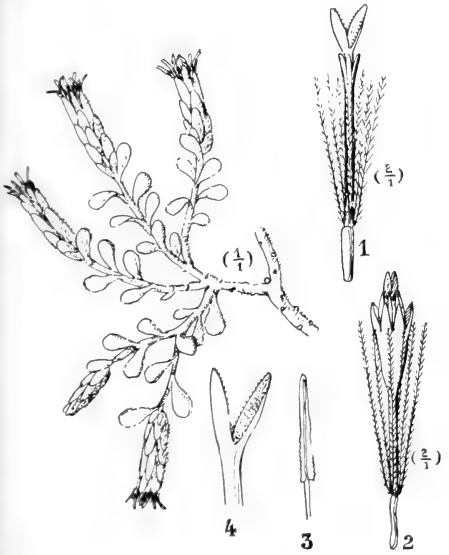
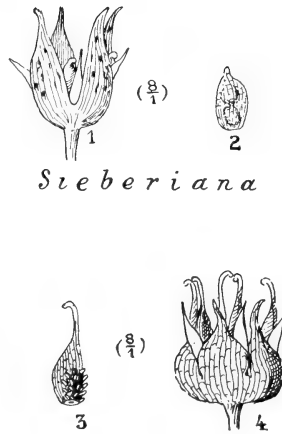


Poranthera triandra sp. nova



Cratystylis conocephala S. Moore



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Brachycome tesquorum sp. nov.

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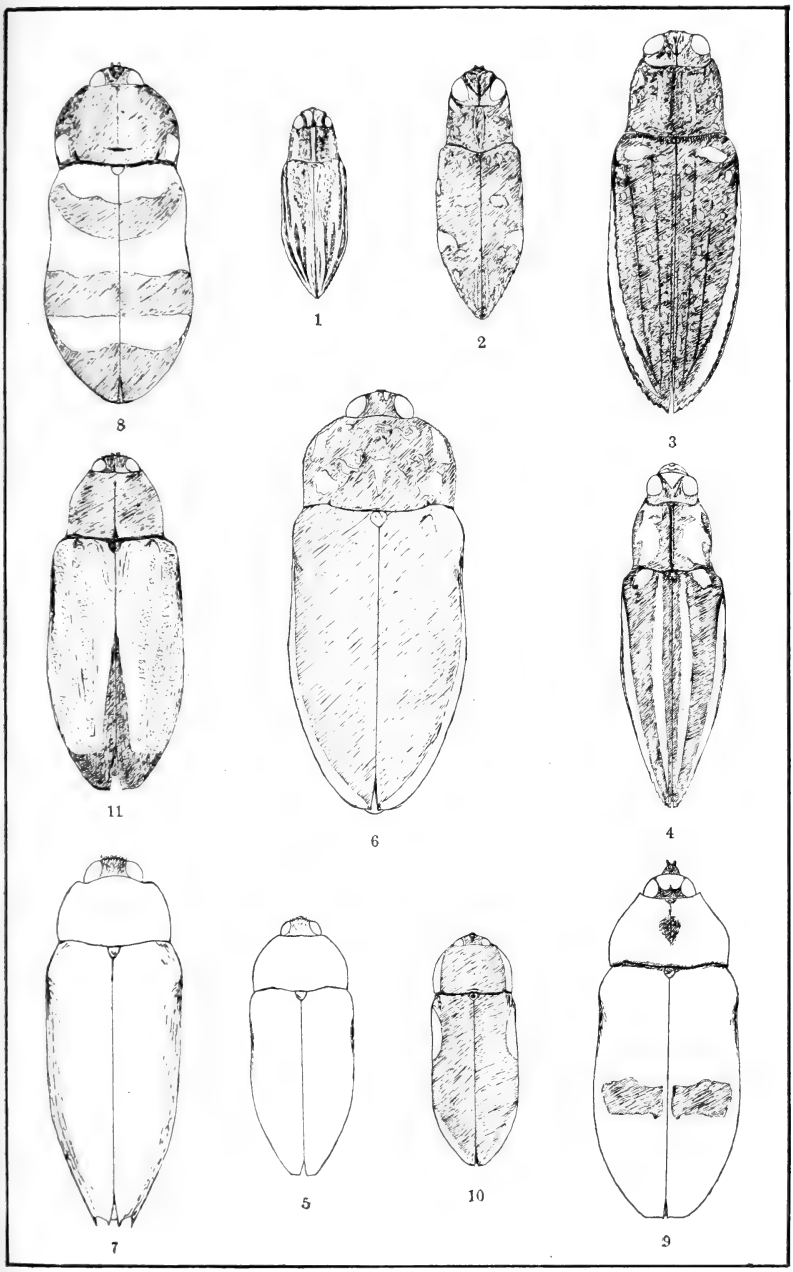

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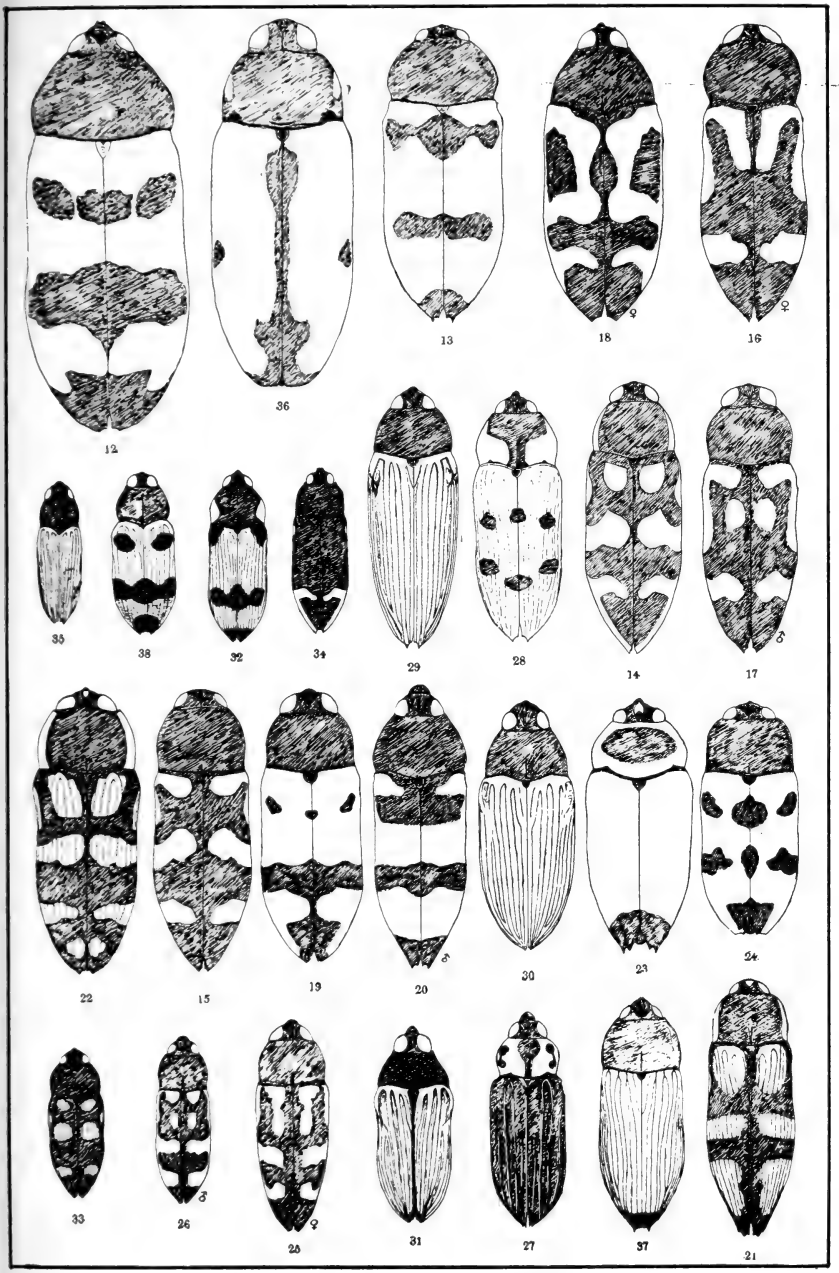

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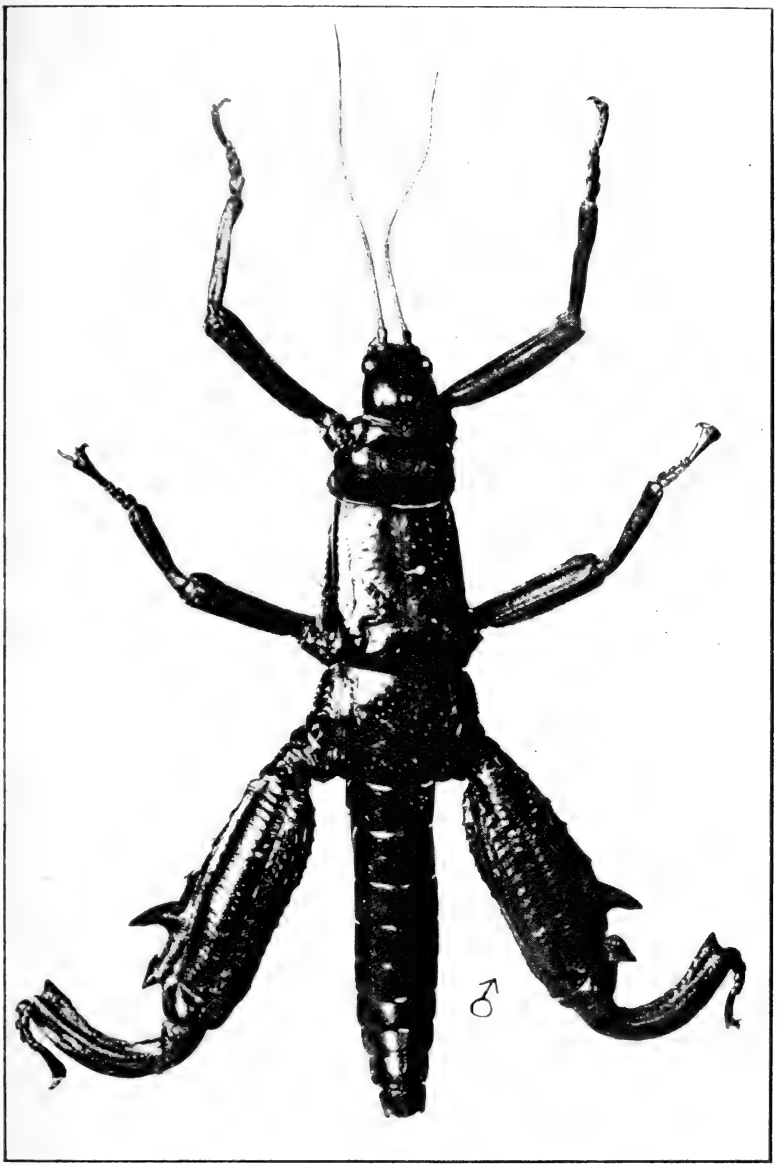

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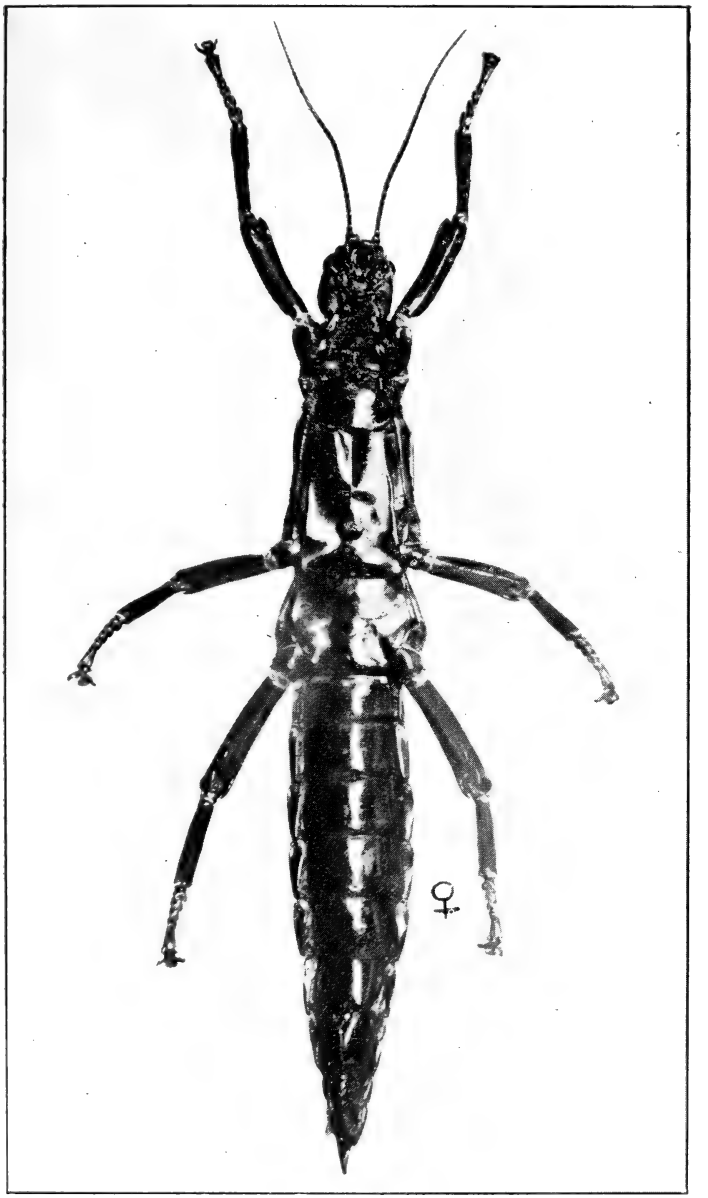

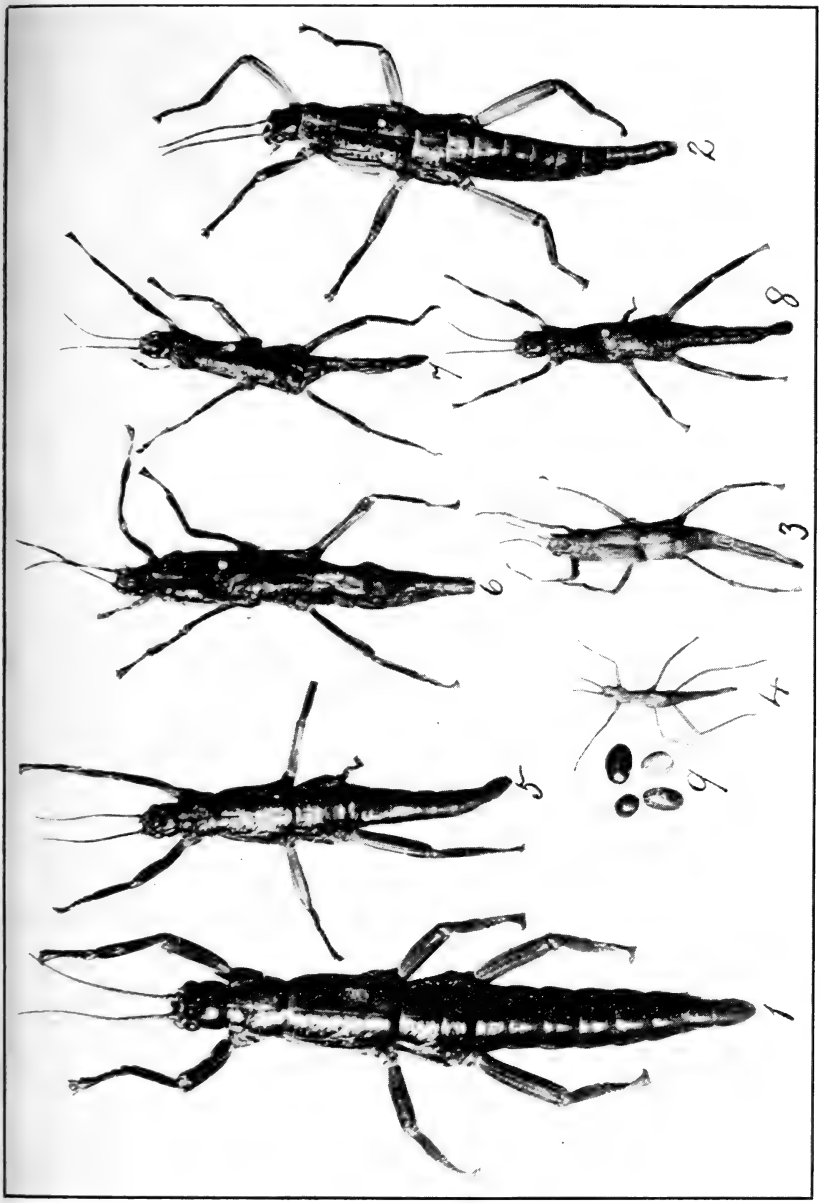
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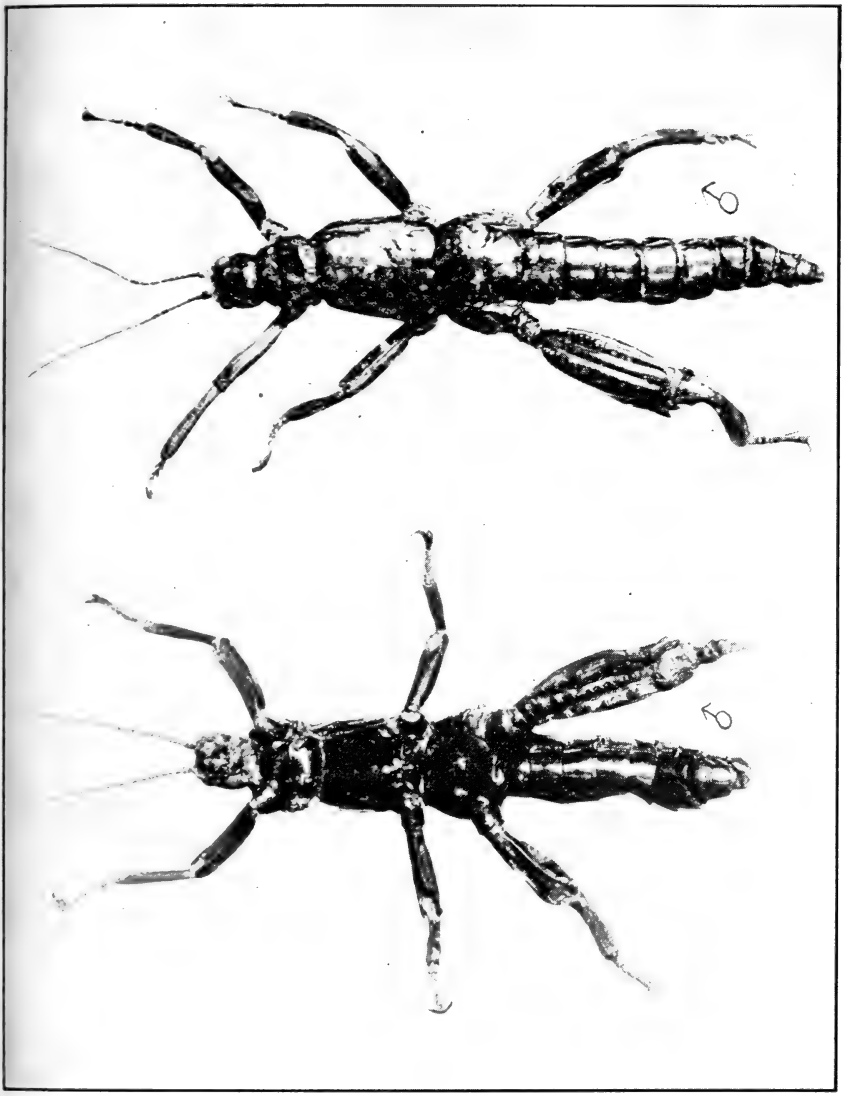

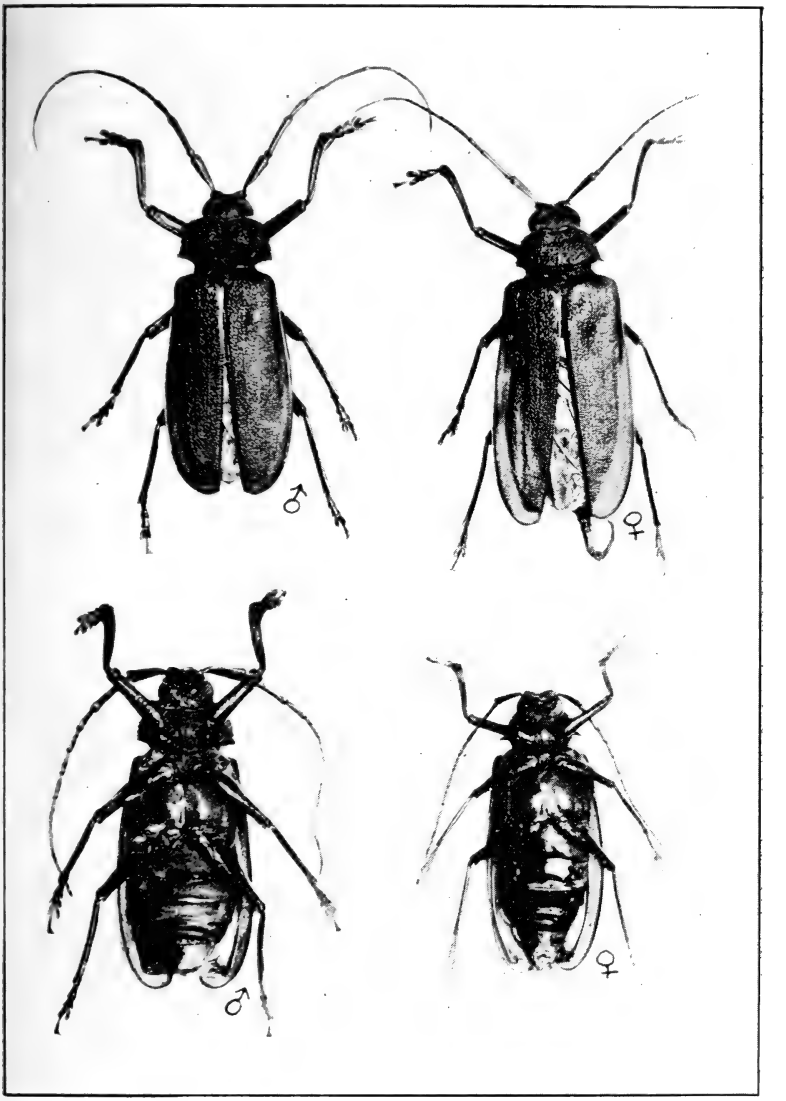

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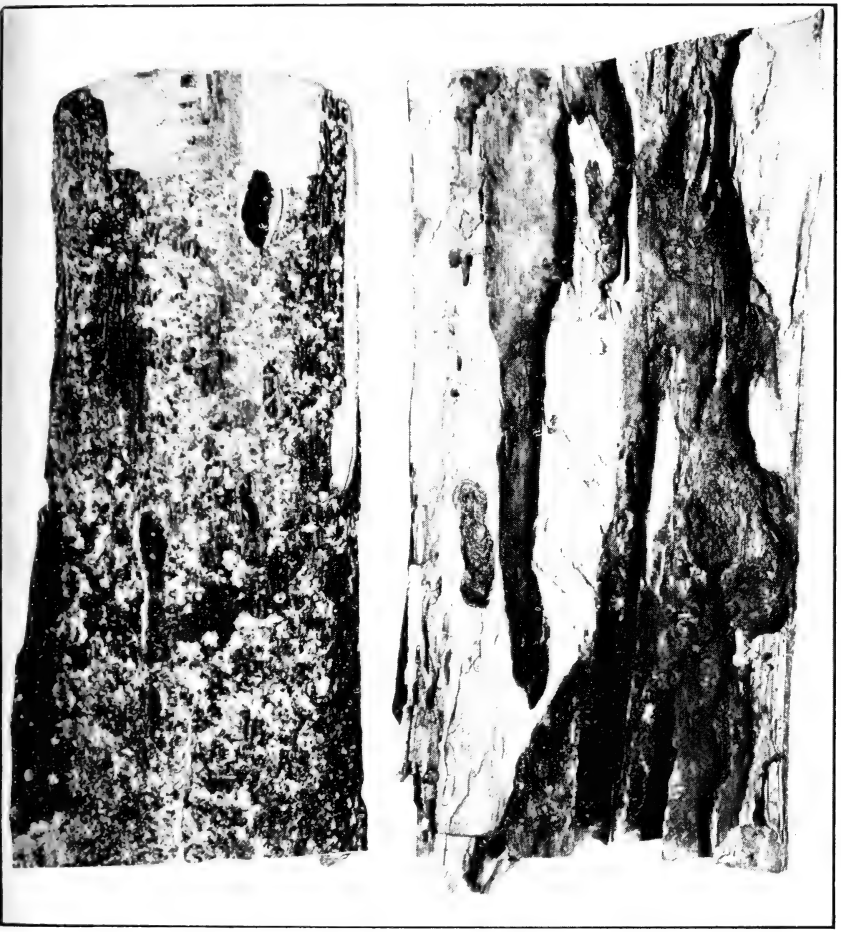

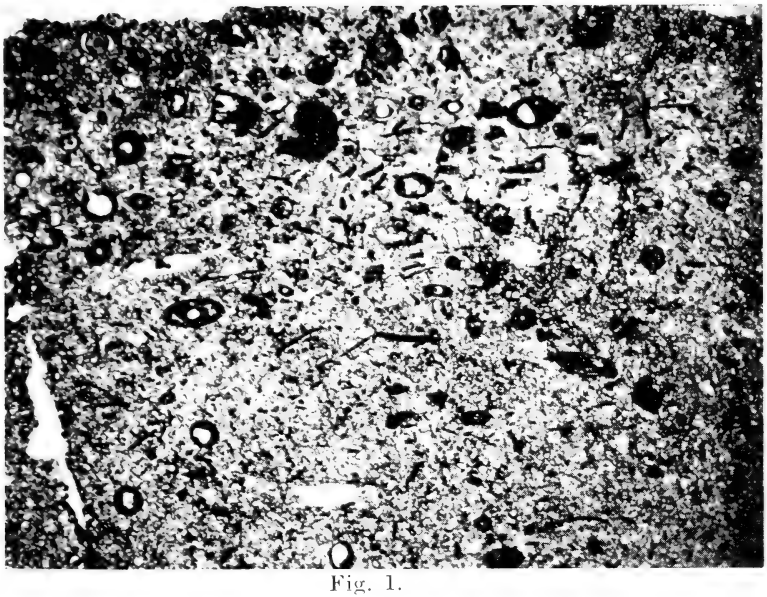

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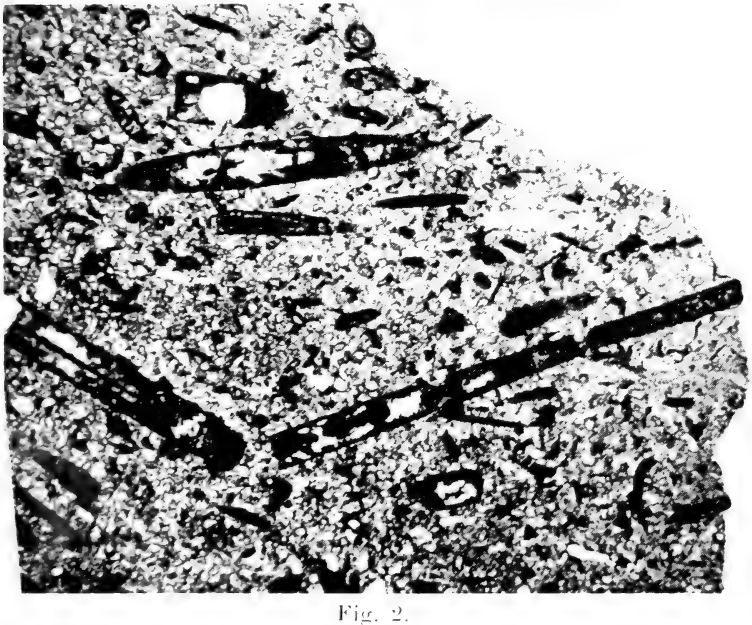

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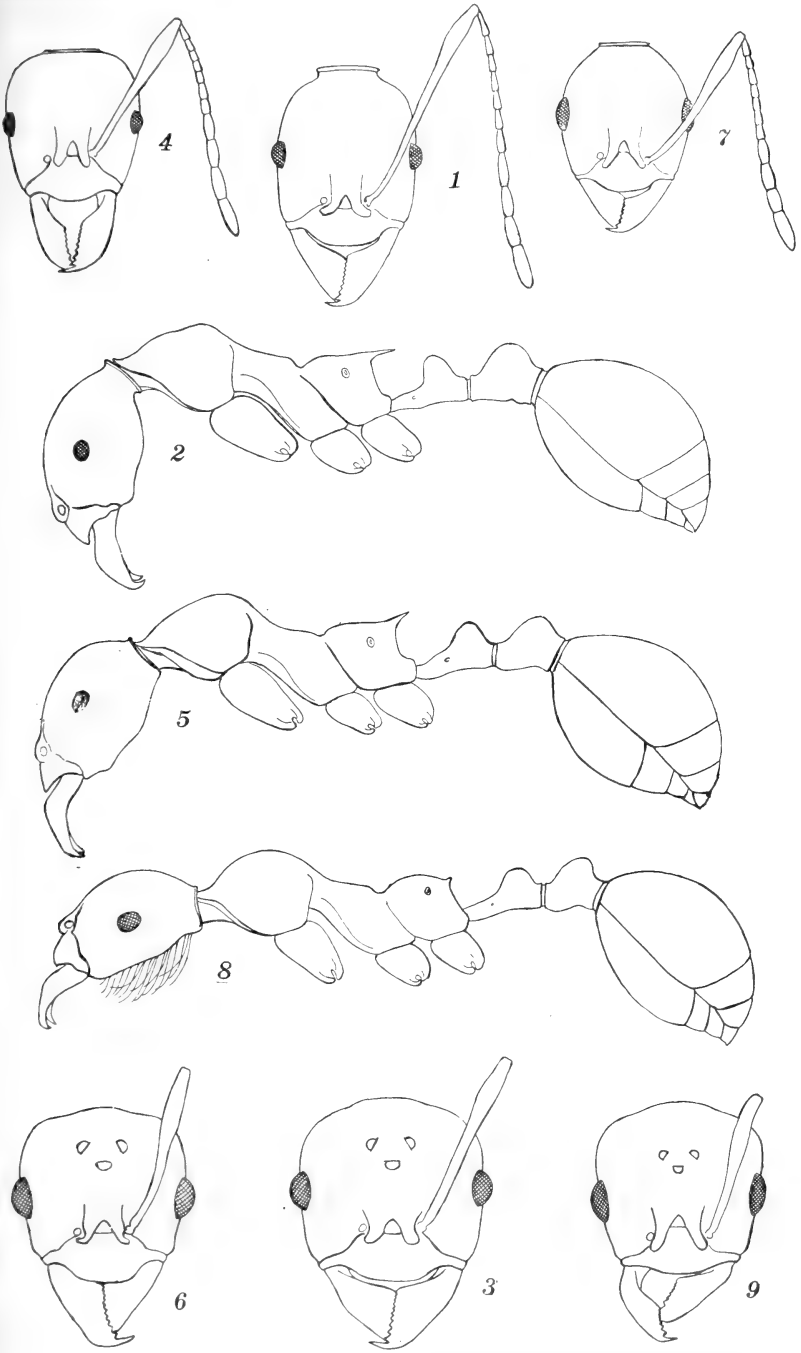
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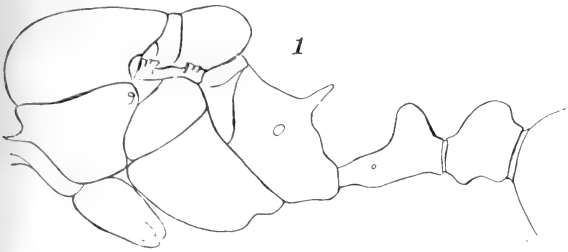

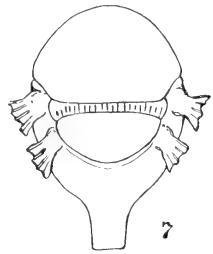

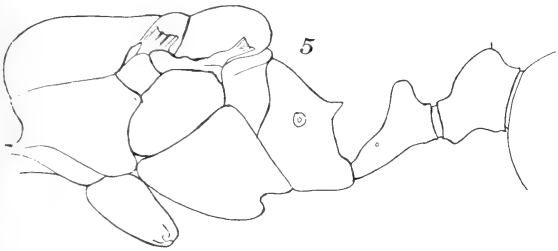

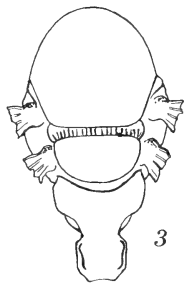

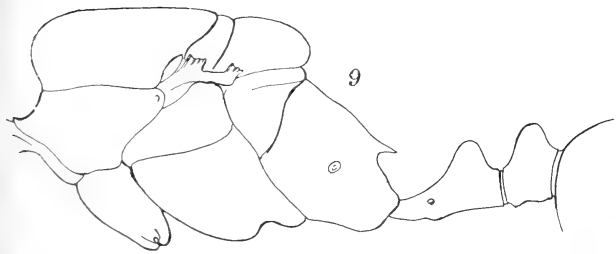

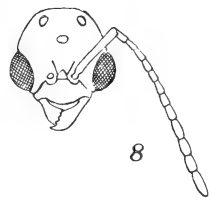

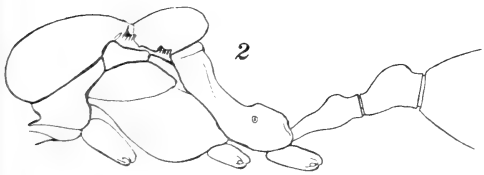

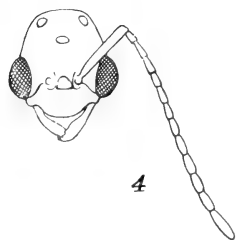

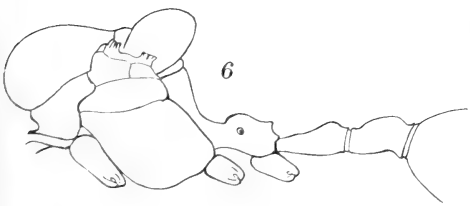

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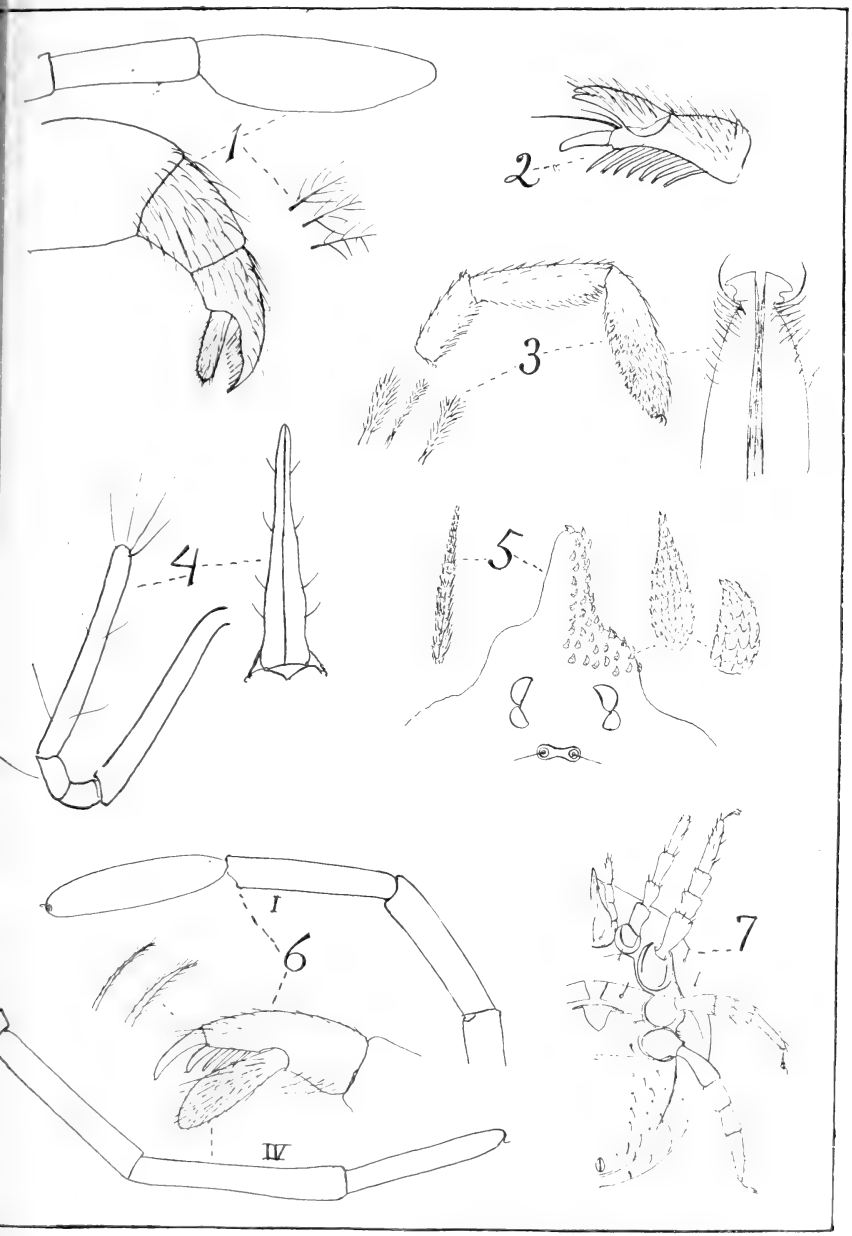
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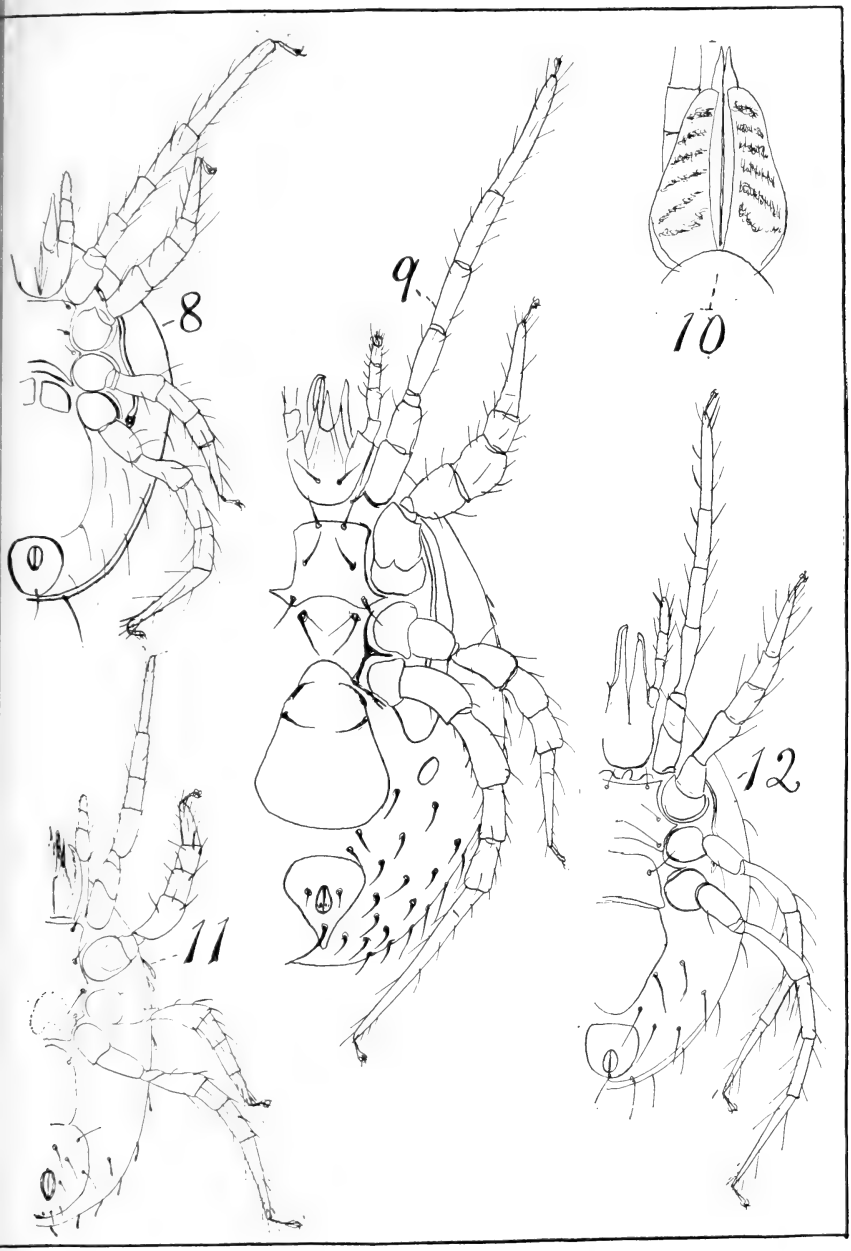

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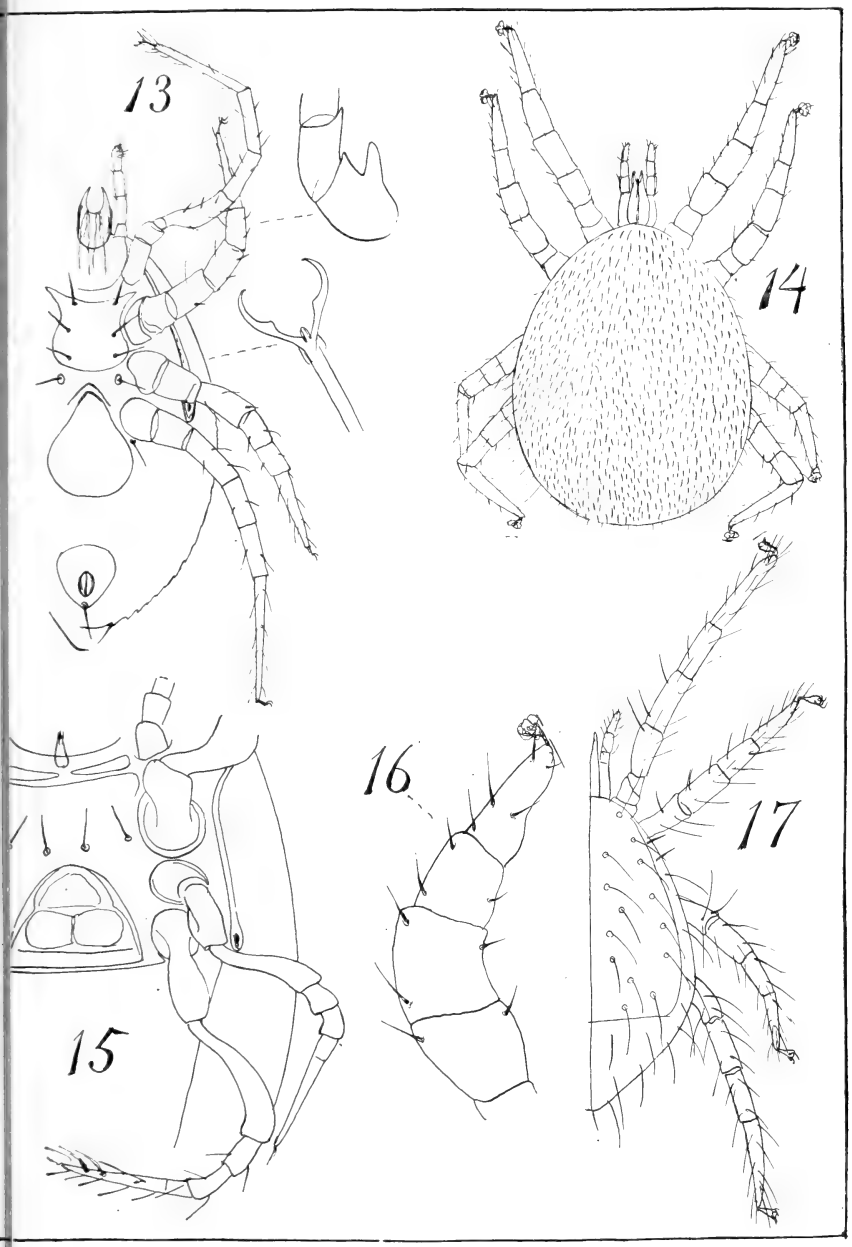

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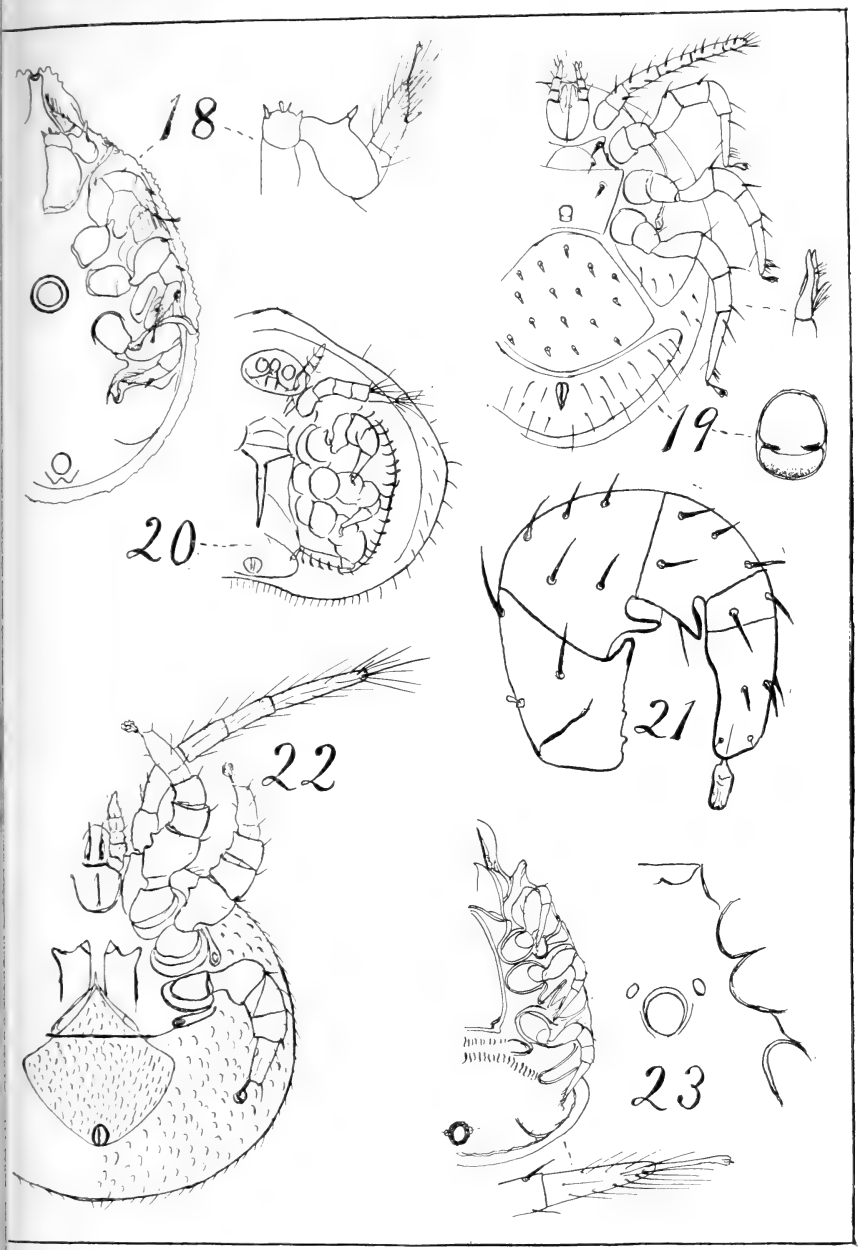
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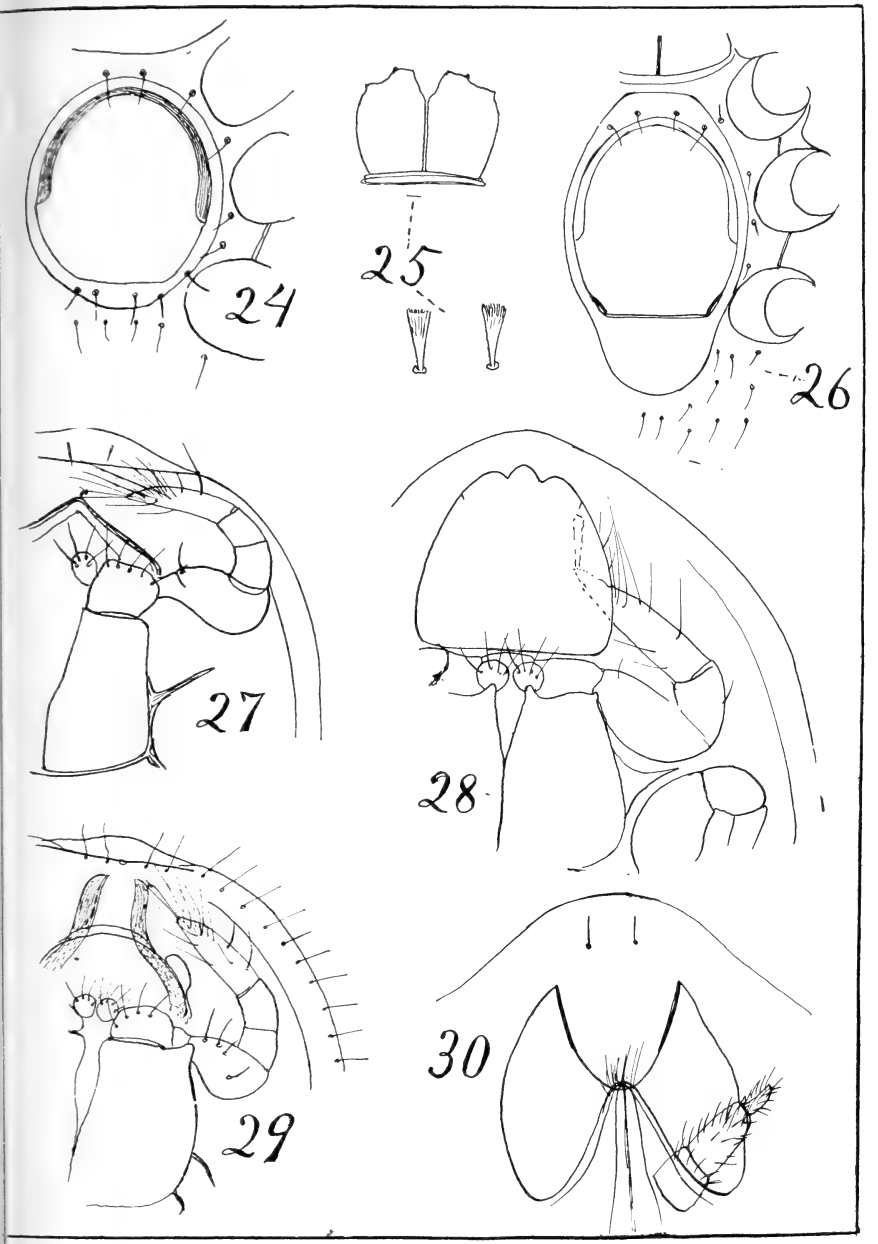

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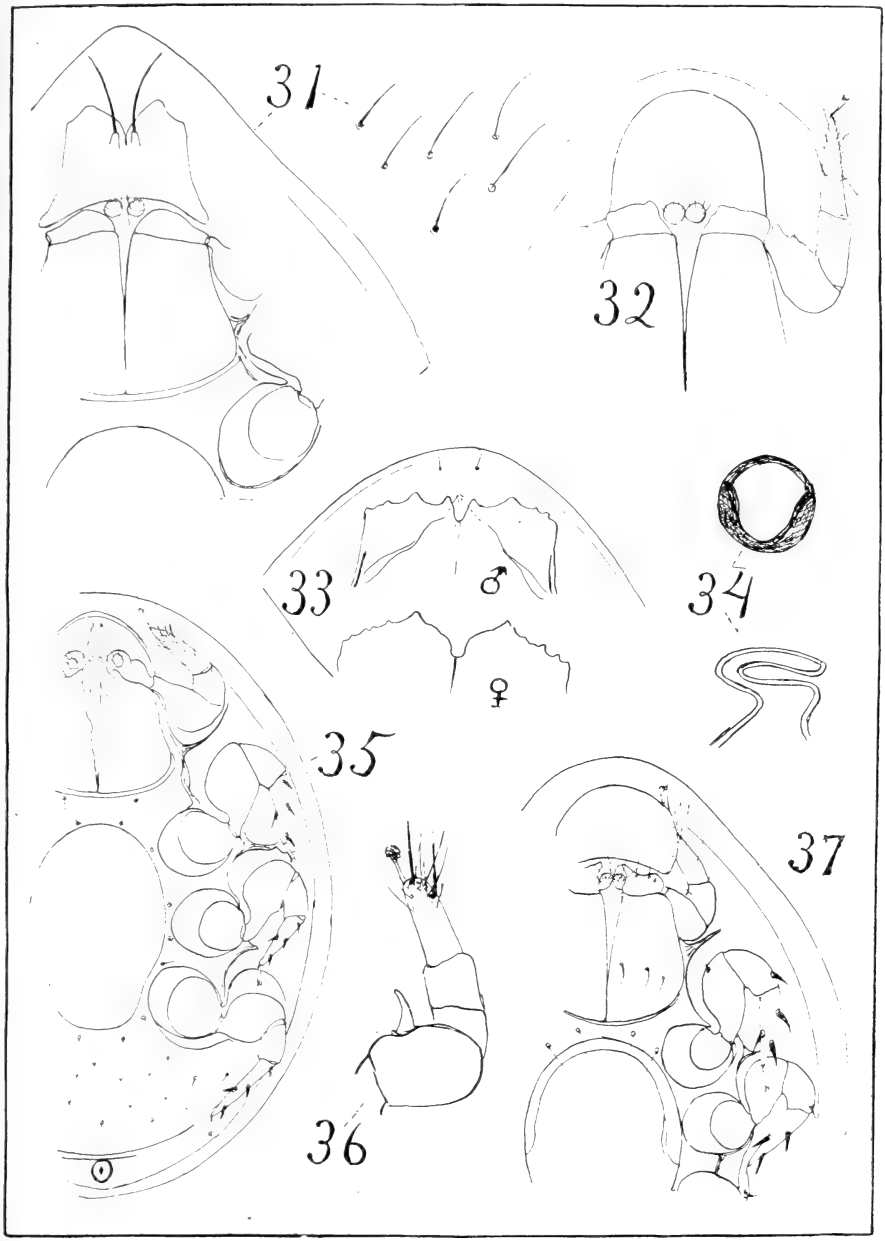

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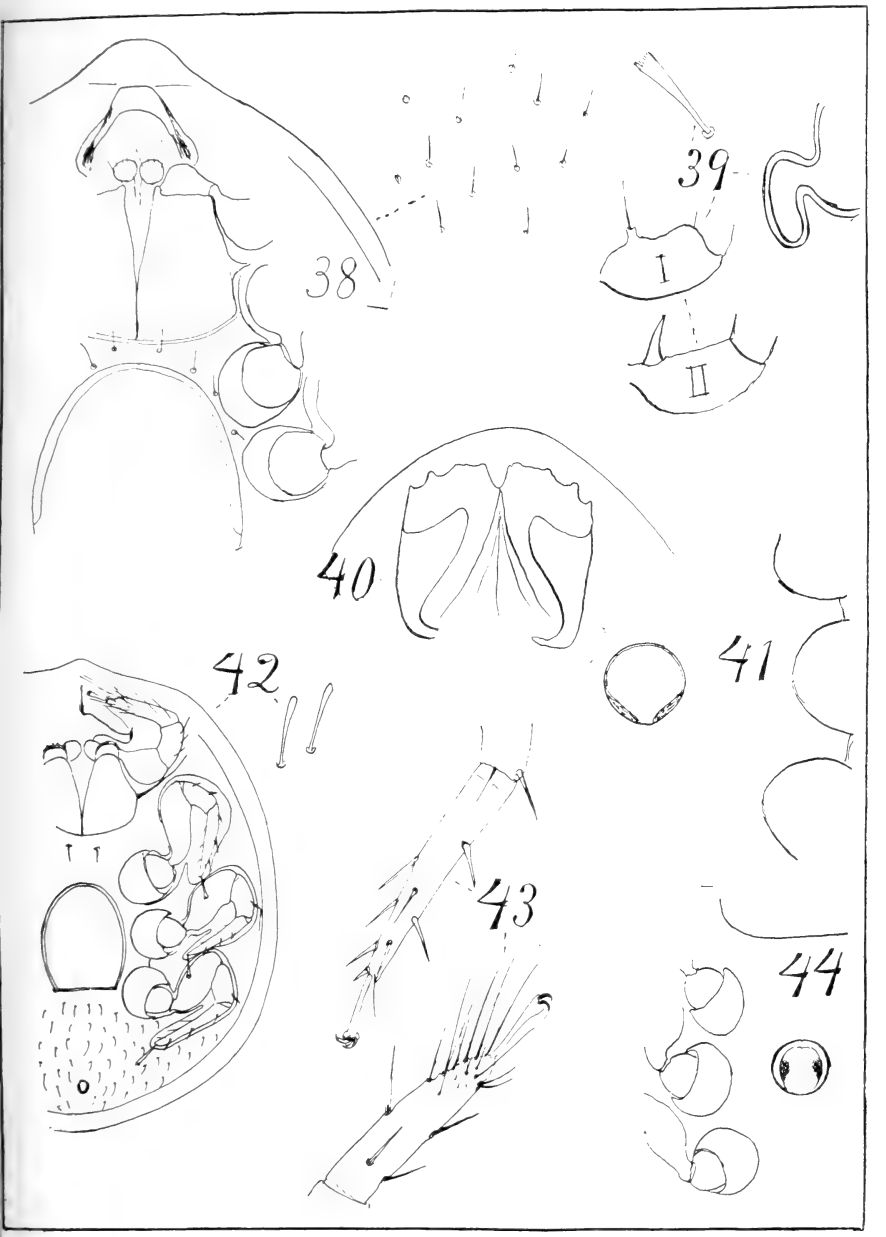

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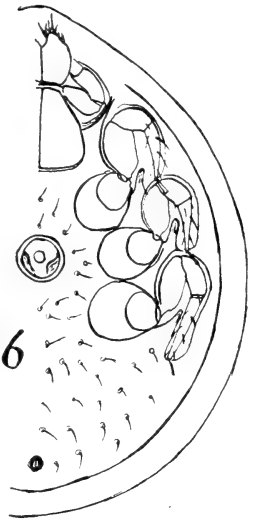

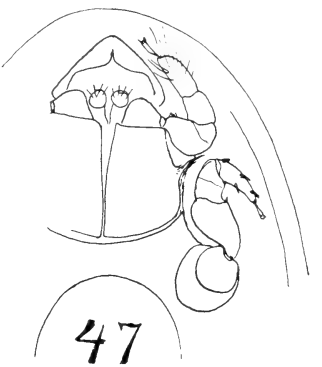

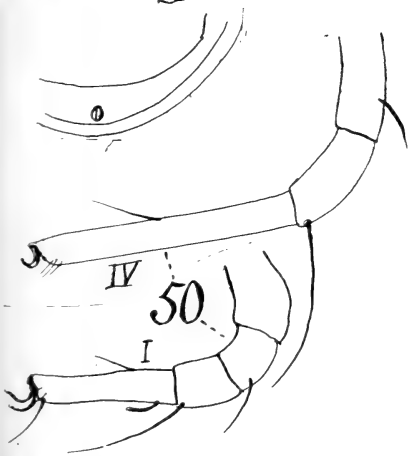

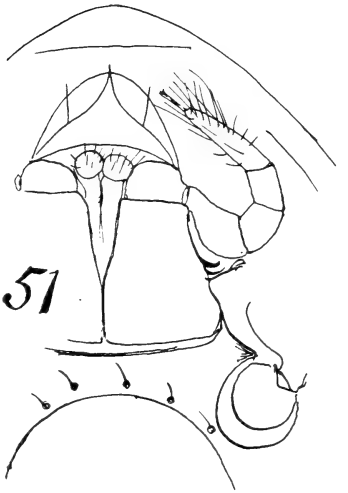

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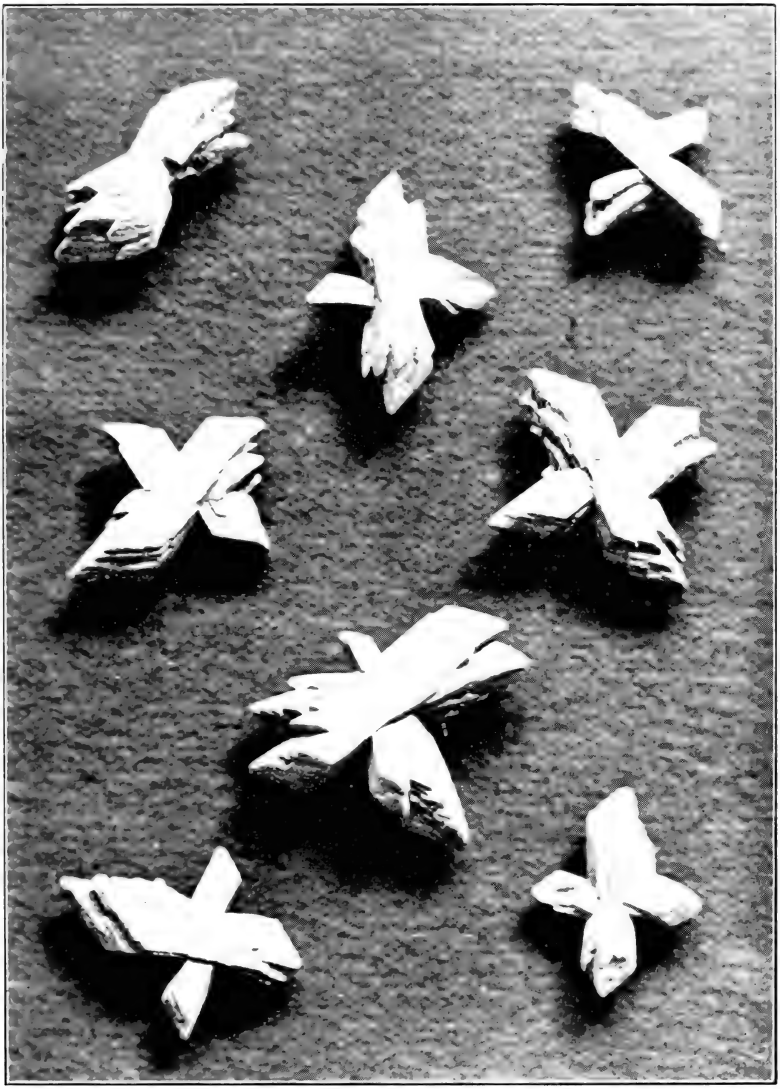

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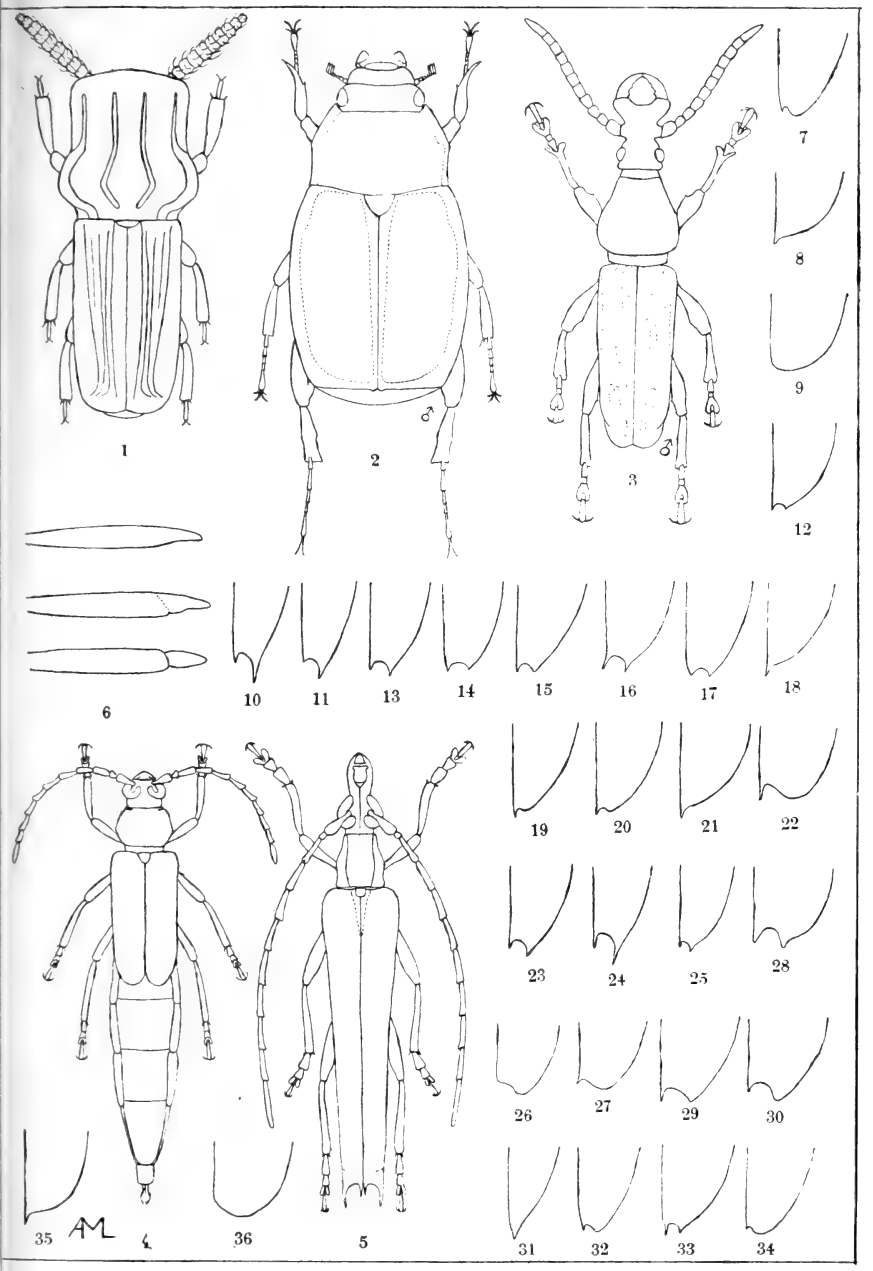

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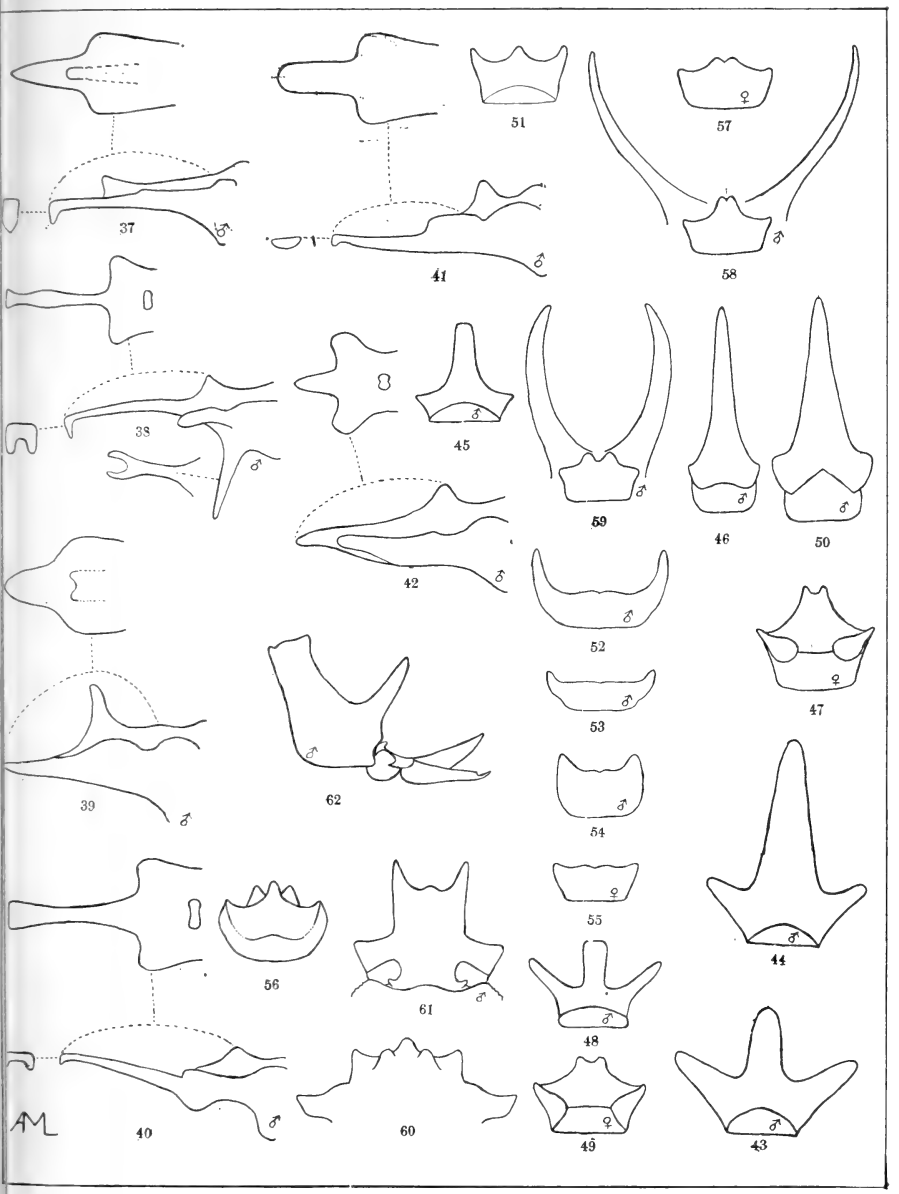

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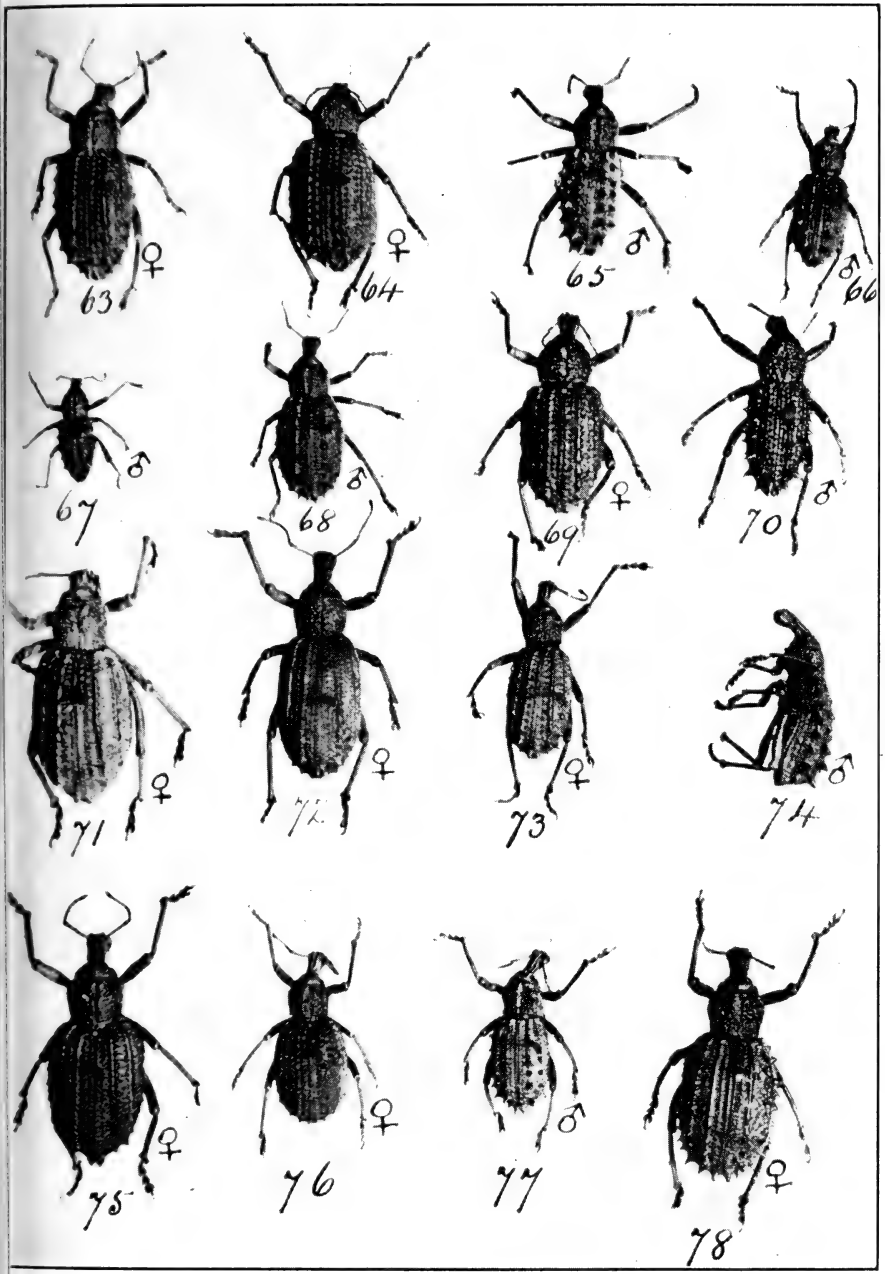

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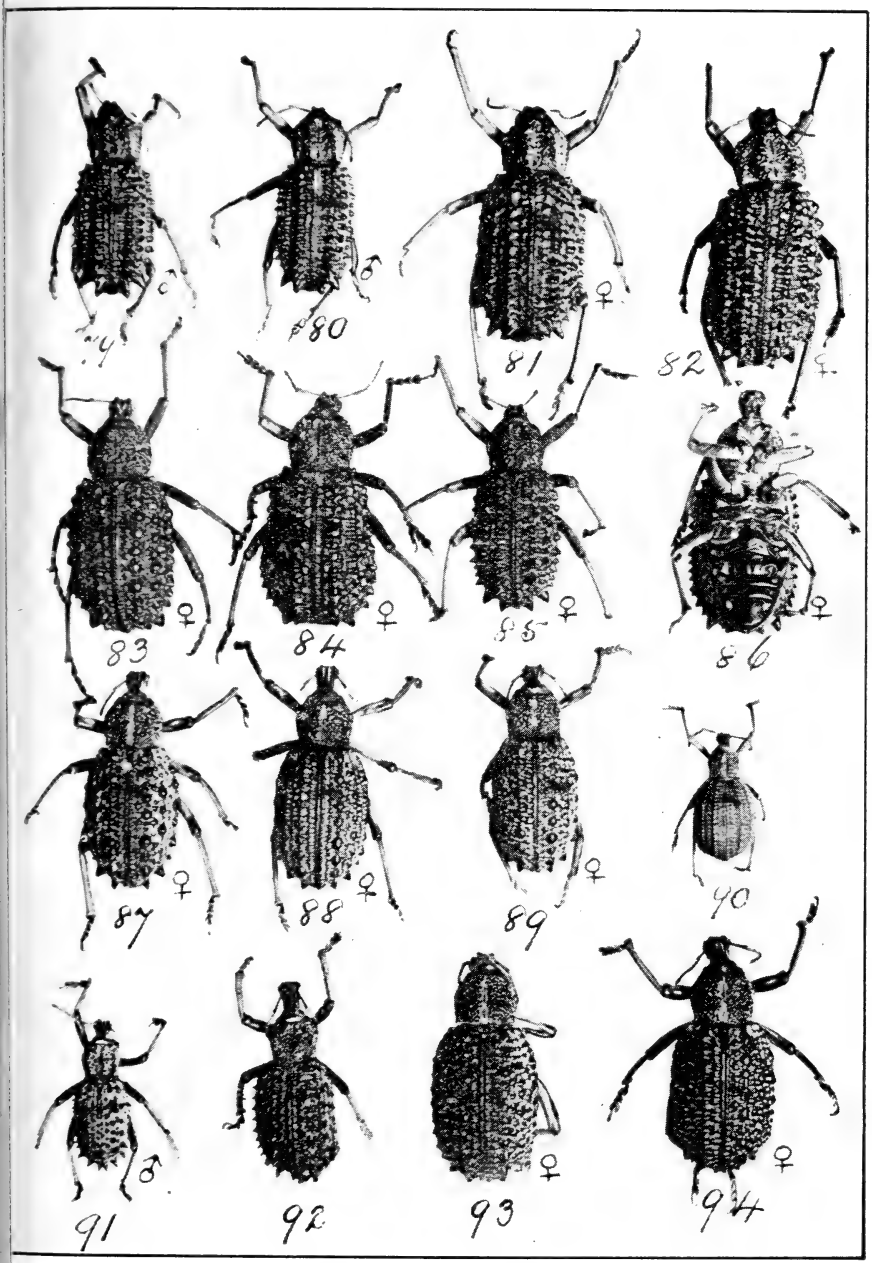

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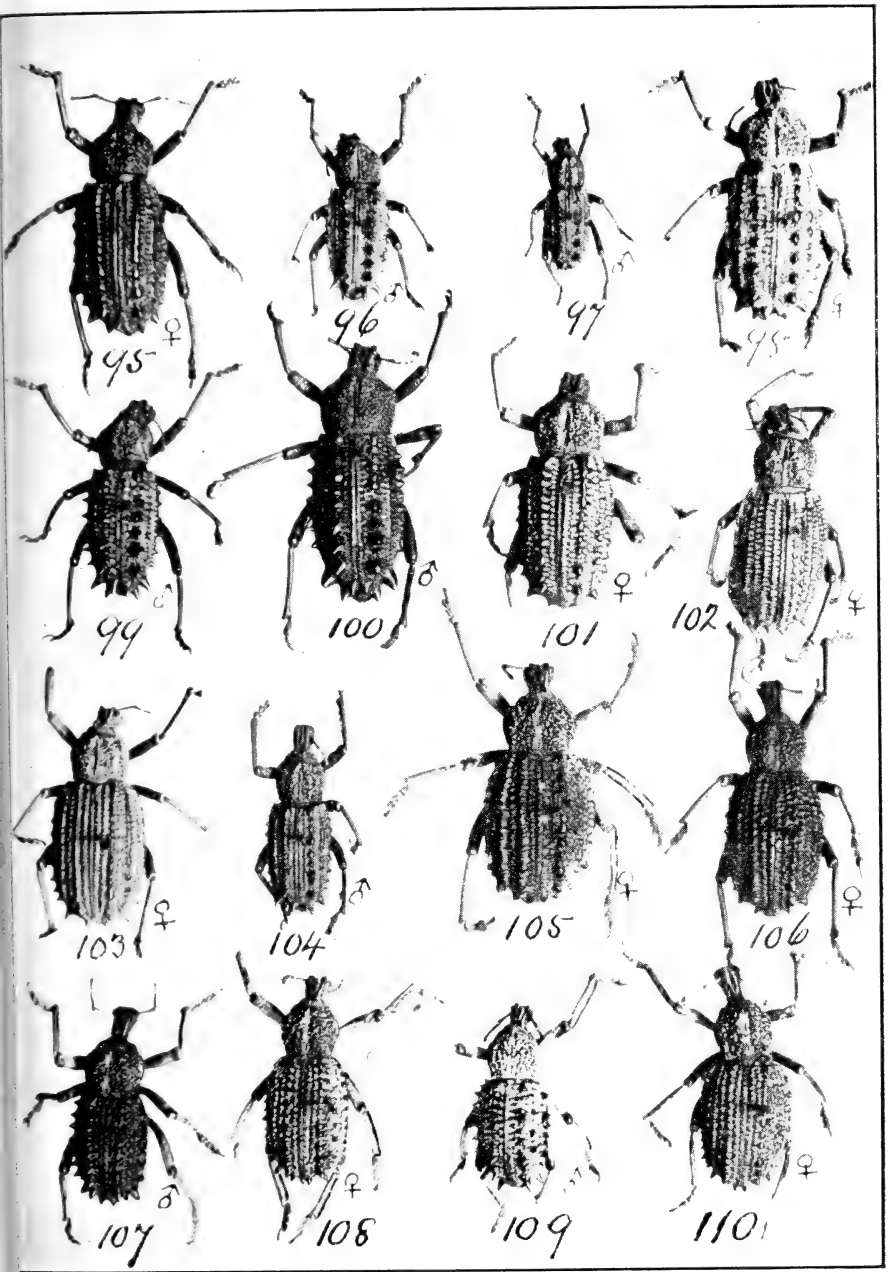
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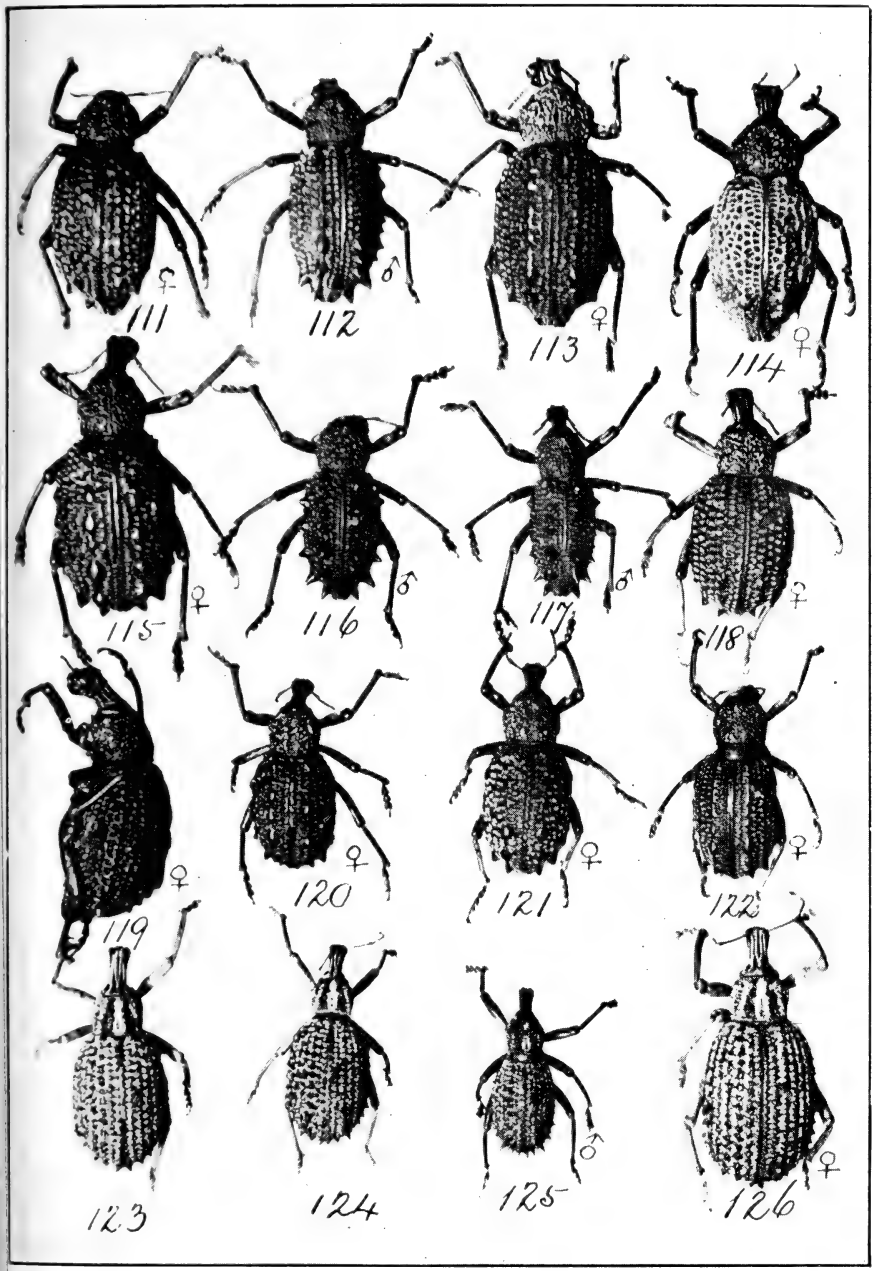

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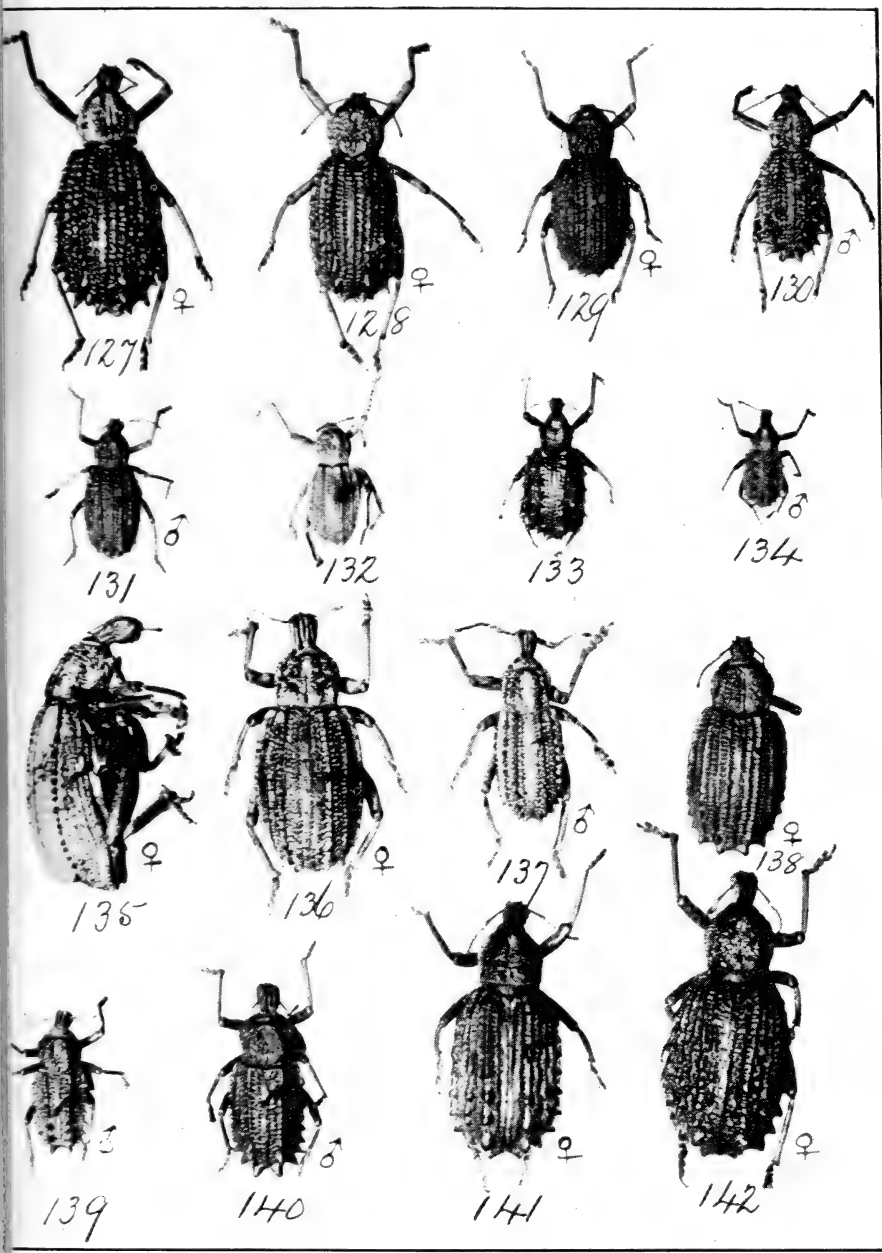

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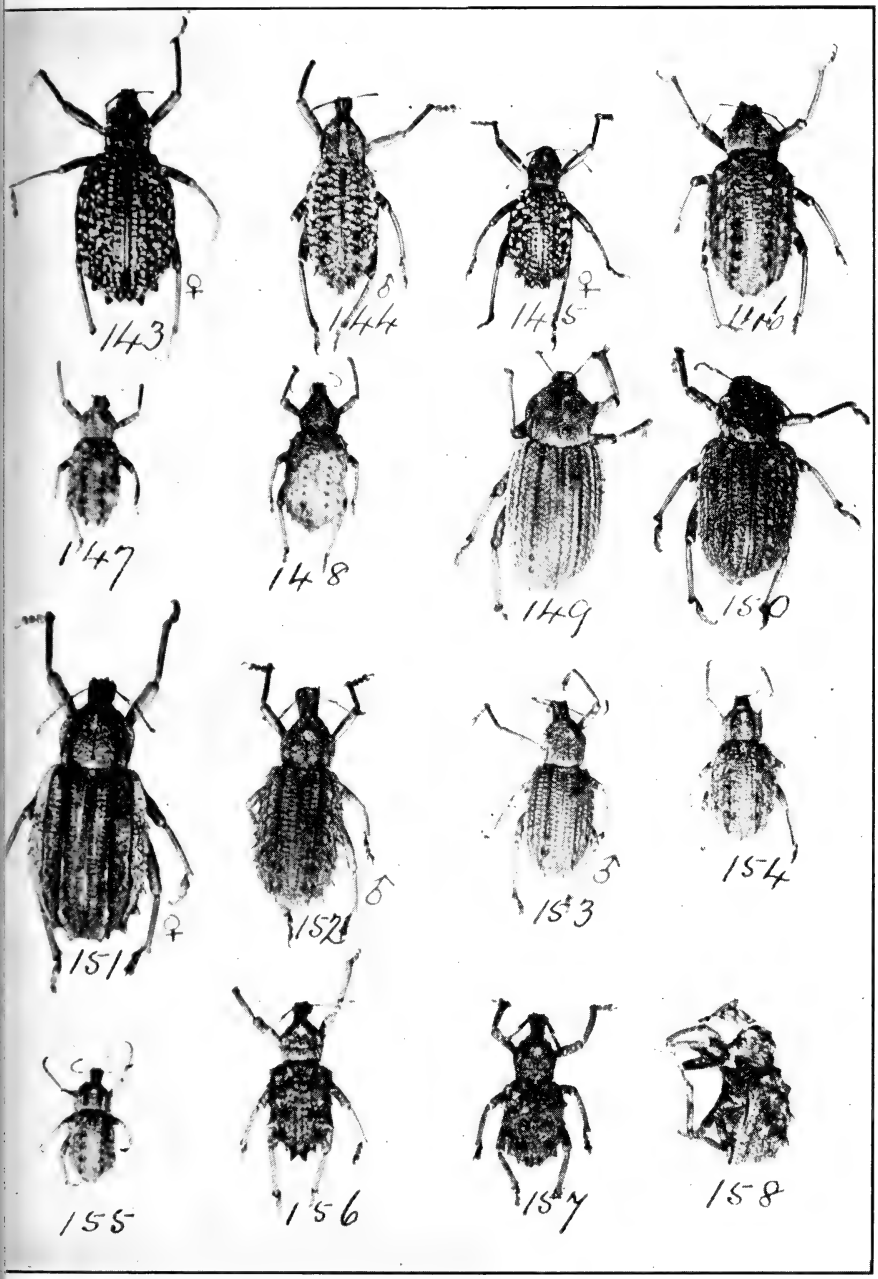

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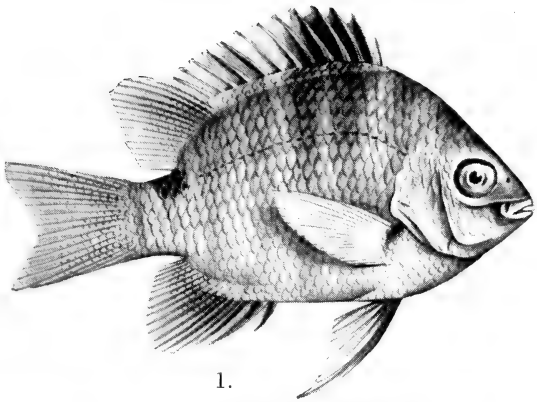

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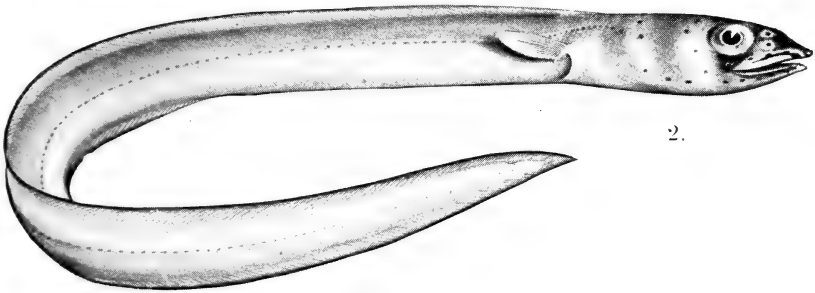

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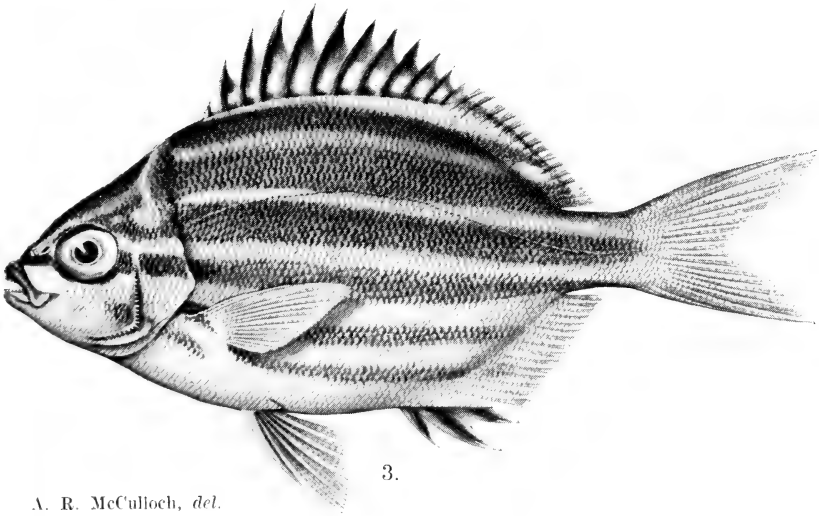
Congermuraena howensis, n. sp.



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Atypichthys latus, n. sp.

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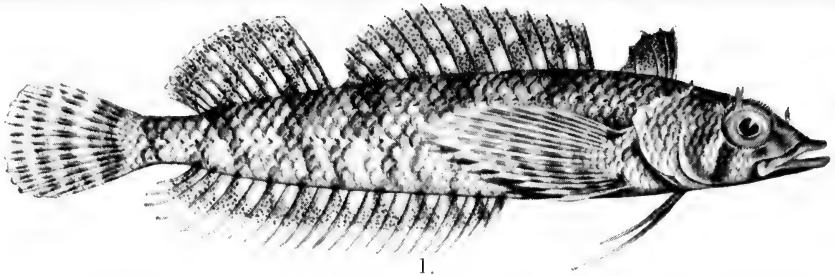

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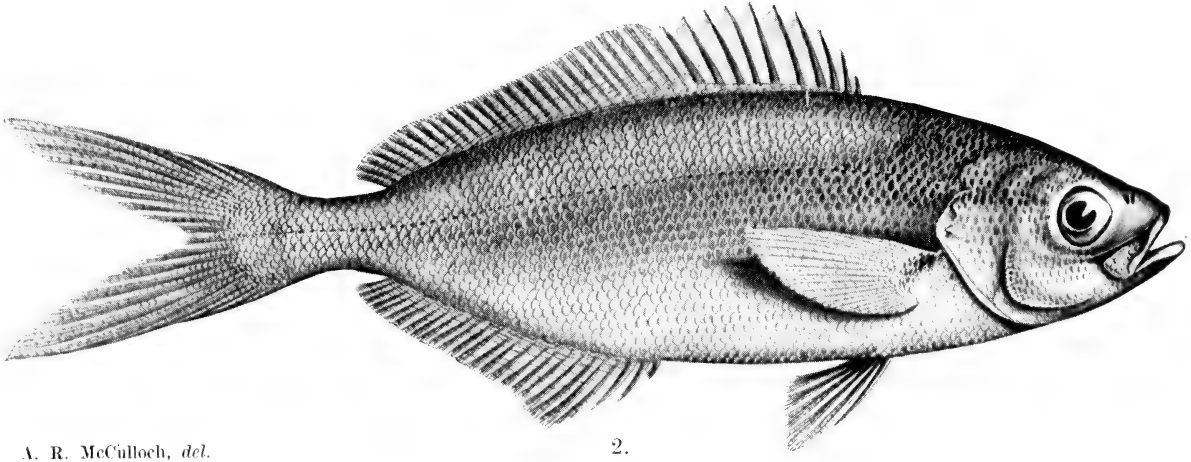
Gillias squamiceps, n. sp.



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2.

Labracoglossa nitida, n. sp.

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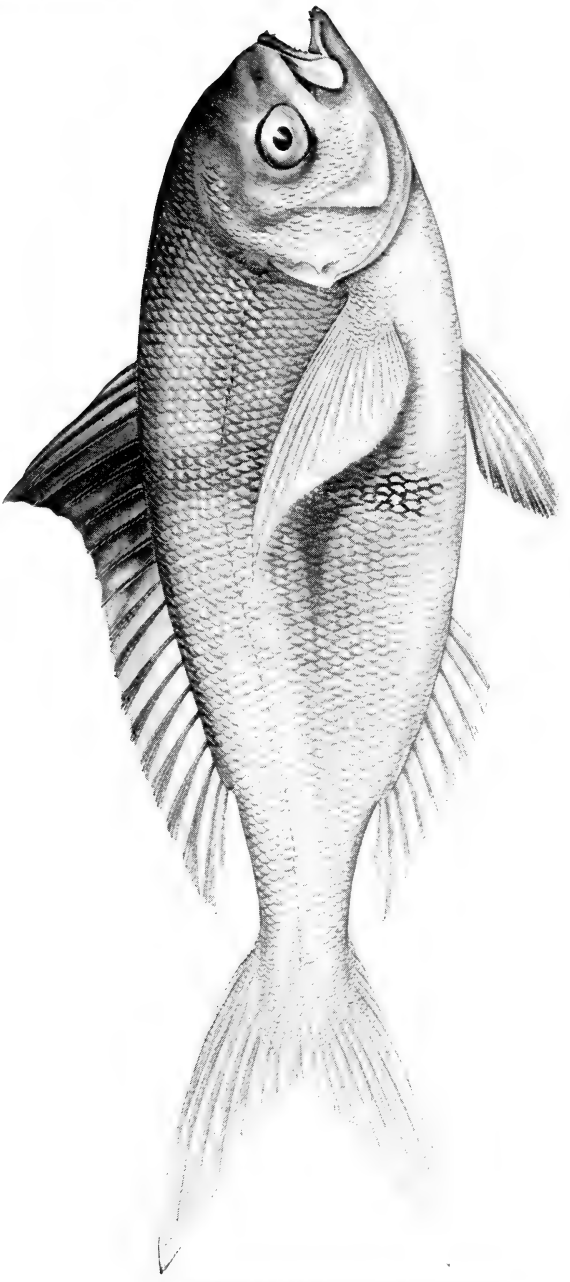

Paracaesio pedtergi, n. sp.

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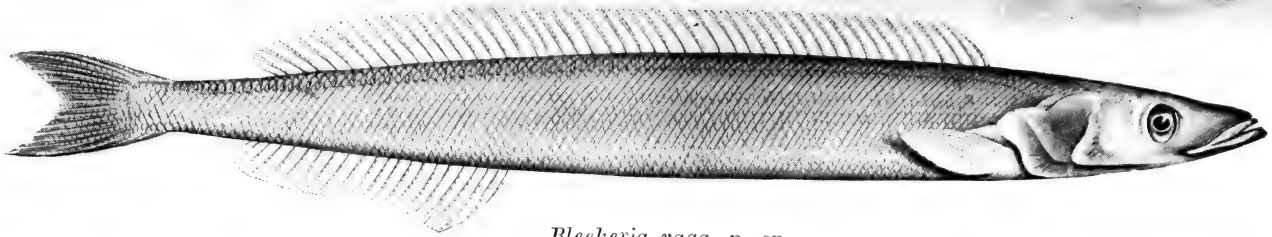
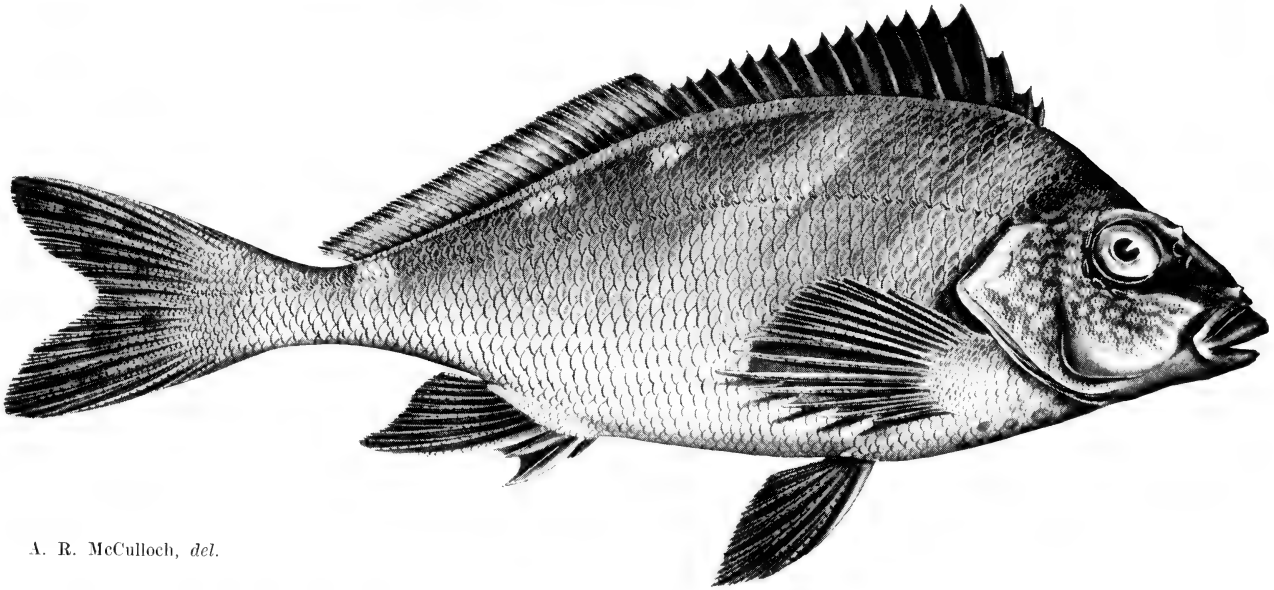


Bleekeria vaga, n. sp.



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Cheilodactylus ephippium, n. sp.

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Myxus elongatus, Günther.

Edgar R. Waite, *del.*

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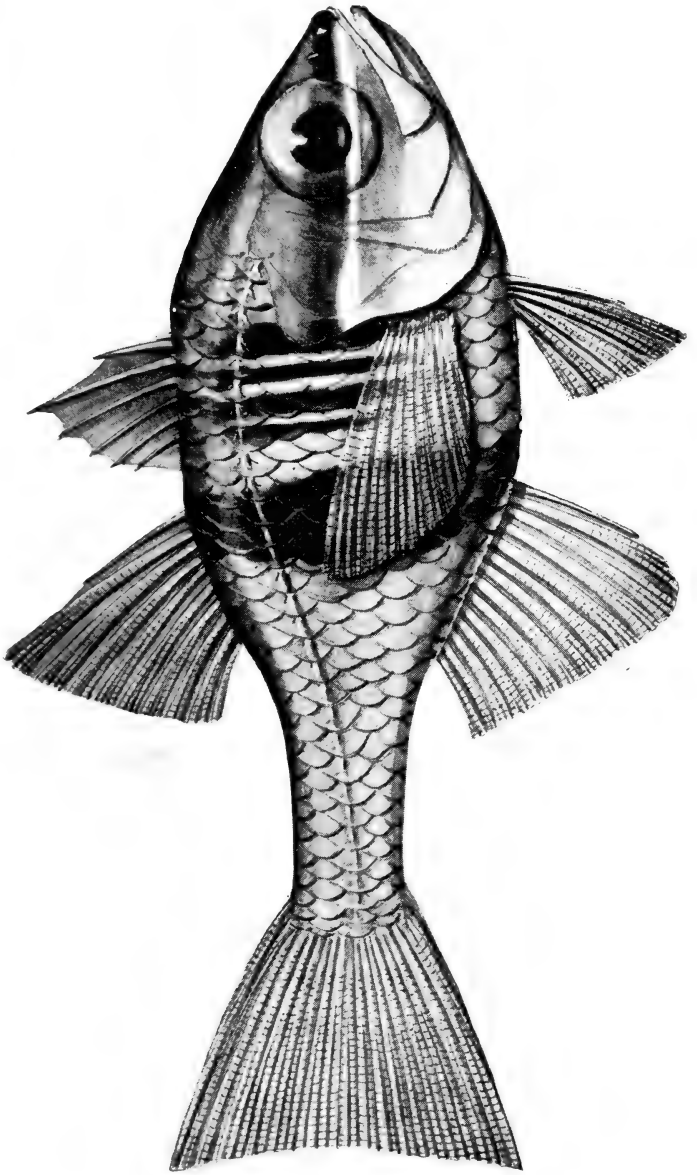

Archamia leai, n. sp.

Edgar R. Waite, *del.*

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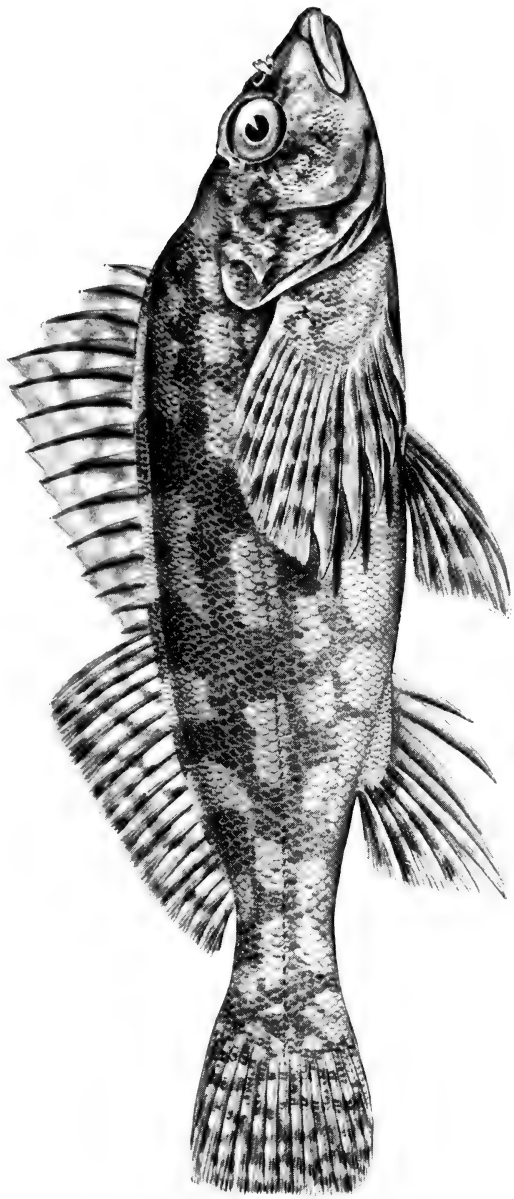

Chironemus microlepis, n. sp.

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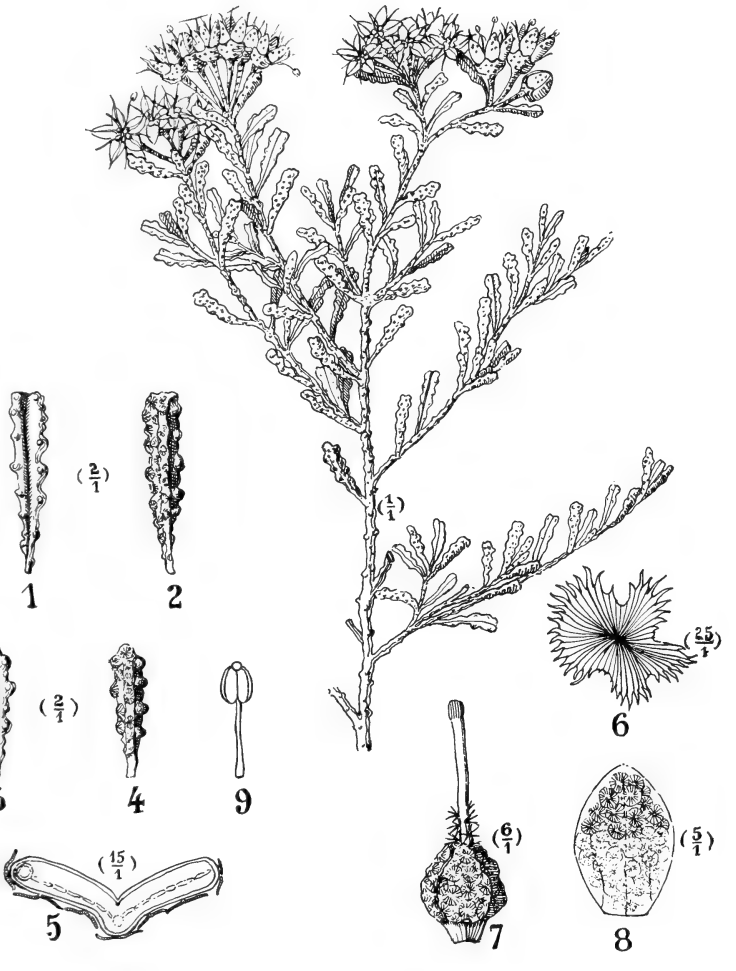

Phebalium bullatum *sp.n.*

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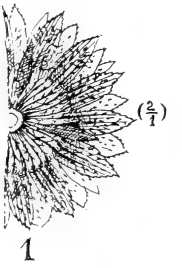

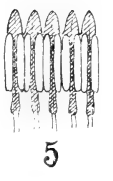

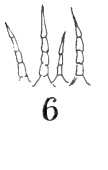

Erigeron sessilifolius *F.v.M.*

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C.T. del.

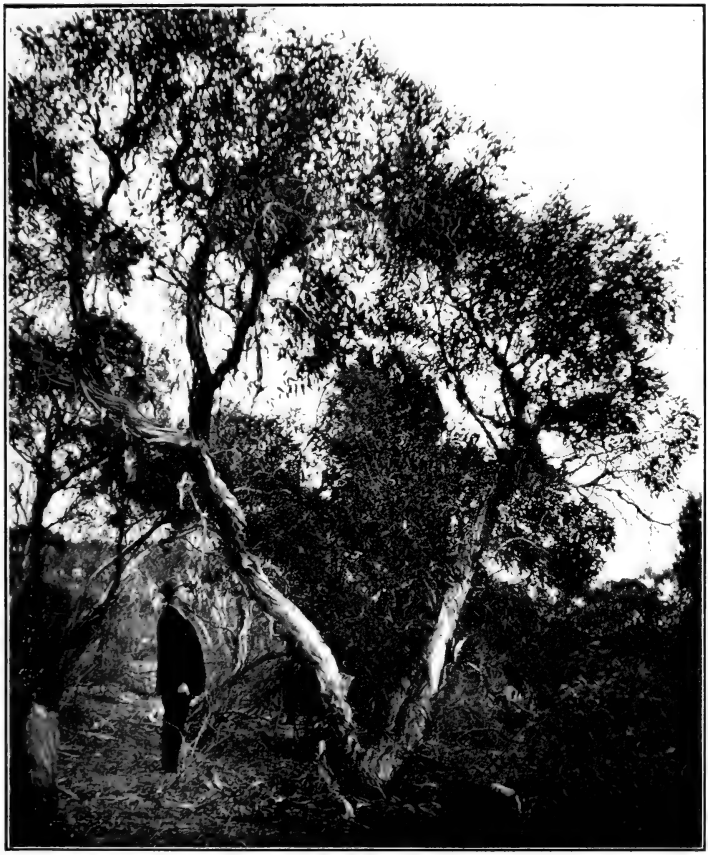
EUCALYPTUS CNEORIFOLIA, DC.

R.T.B. del.

EUCALYPTUS ODORATA, BEHR.

[PHOTO, W. GILL.]

EUCALYPTUS CALYCOGONA, TURCZ.



[PHOTO, W. GILL.]

EUCALYPTUS OLEOSA, F.v.M.

Photo. W. Howchin. Fig. 1. Mount Remarkable.

Photo. W. Howchin.

Fig. 2. The "Cat-Rocks," Mount Remarkable.

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TRANSACTIONS AND PROCEEDINGS

OF THE

ROYAL SOCIETY of SOUTH AUSTRALIA

(INCORPORATED).

VOL. XL.

[With Fifty-four Plates and Twenty-one Figures in the Text.]

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Assisted by ARTHUR M. LEA, F.E.S.

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